

|                                                                                                                                                                                                                                                                                                 |        |     |                           |  |                      |                 |                                                         |      |                 |         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----|---------------------------|--|----------------------|-----------------|---------------------------------------------------------|------|-----------------|---------|
| REVISION HISTORY                                                                                                                                                                                                                                                                                |        |     | VARIATIONS FOR THIS ASSY. |  | FIRST USED ON: M9312 |                 | DIGITAL EQUIPMENT CORPORATION<br>MAYNARD, MASSACHUSETTS |      |                 |         |
| CHK                                                                                                                                                                                                                                                                                             | ECO NO | REV |                           |  | MADE BY: B CRAMM     | DATE: 1 AUG 78  | TITLE                                                   |      |                 |         |
|                                                                                                                                                                                                                                                                                                 |        |     |                           |  | CHECKED: N POLLITT   | DATE: 17 AUG 78 | ROM LISTING BOOTSTRAP                                   |      |                 |         |
|                                                                                                                                                                                                                                                                                                 |        |     |                           |  | DSN.ENG.: B GIST     | DATE: 1 AUG 78  | SIZE                                                    | CODE | DOCUMENT NUMBER | REV     |
|                                                                                                                                                                                                                                                                                                 |        |     |                           |  | PROD.: D PETERSON    | DATE: 3 AUG 78  | K                                                       | SP   | M9312-0-7       | A       |
|                                                                                                                                                                                                                                                                                                 |        |     |                           |  | RESP.ENG.: E CROCKER | DATE: 1 AUG 78  | ASSY. #:                                                |      |                 | EDIT NO |
|                                                                                                                                                                                                                                                                                                 |        |     |                           |  |                      |                 |                                                         |      |                 | 11      |
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## M9312 BOOTSTRAP ROM LISTING

THIS ROM WILL BOOT THE PC11 OPTION(S)

TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS, THE START ADDR IS 173Y34.  
 TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS, THE START ADDR IS 173Y36.  
 THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.  
 IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX  
 IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.  
 IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.  
 IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

.SBTTL TTY BOOT  
 .SBTTL ;PC, DL BOOT

000000 050122  
 000002 000026  
 000004 000261  
 000006 012700 000000  
 000012 012701 177550  
 000016 010704  
 000020 103064  
 000022 000412  
 000024 173000  
 000026 000340  
 000030 052124  
 000032 000146  
 000034 000261  
 000036 012700 000000  
 000042 012701 177560  
 000046 000763  
 000050 012705 160000  
 000054 012703 000004  
 000060 010723  
 000062 005013  
 000064 012706 000502  
 000070 010145  
 000072 042705 000032  
 000076 012725 016701  
 000102 012725 000026  
 000106 012725 012702  
 000112 012725 000352  
 000116 012725 005211  
 000122 012725 105711  
 000126 012725 100376  
 000132 012725 116162  
 000136 012725 000002  
 000142 010515  
 000144 105025  
 000146 005205

HSR: .ASCII "RP" ;HIGH SPEED READER BOOT.  
 .WORD <HSRE-.+2> ;OFFSET TO NEXT BOOT.  
 SEC ;ENTRY  
 MOV #0,R0 ;ENTRY POINT TO NO DIAG.  
 HSRM: MOV #HSRCR,R1 ;LOAD CSR ADDR. INTO R1.  
 CFUDGE: MOV PC,R4 ;ENTRY POINT  
 BCC BDIAG ;GO DO DIAG.  
 BR LOAD  
 .WORD MRESERVED  
 HSRE: .WORD RESERVED  
 TT: .ASCII "TT" ;LOW SPEED READER.  
 .WORD <TTE-.+2> ;OFFSET TO NEXT BOOT.  
 SEC  
 MOV #0,R0  
 TTM: MOV #TTCR,R1 ;LOAD CSR ADDR. INTO R1.  
 BR CFUDGE  
 LOAD: MOV #160000,R5  
 MOV #4,R3 ;PUT ERRVEC INTO R3  
 MOV PC,(R3)+ ;PUT RETURN ADDR IN ERRVEC  
 CLR (R3)  
 1s: MOV #502,SP  
 MOV R1,-(R5) ;TIMES OUT UNTIL RIGHT ADDR!  
 BIC #32,R5  
 MOV #16701,(5)+  
 MOV #26,(5)+  
 MOV #12702,(5)+  
 MOV #352,(5)+  
 MOV #5211,(5)+  
 MOV #105711,(5)+  
 MOV #100376,(5)+  
 MOV #116162,(5)+  
 MOV #2,(5)+  
 MOV R5,(5)  
 CLRB (5)+  
 INC R5

|        |        |        |            |              |                               |
|--------|--------|--------|------------|--------------|-------------------------------|
| 000150 | 012725 | 005267 | MOV        | #5267,(5)+   |                               |
| 000154 | 012725 | 177756 | MOV        | #177756,(5)+ |                               |
| 000160 | 012725 | 000765 | MOV        | #765,(5)+    |                               |
| 000164 | 010115 |        | MOV        | R1,(5)       |                               |
| 000166 | 000165 | 177746 | JMP        | -32(R5)      | ;GO DO BOOT ADDR.=X7744       |
| 000172 | 000137 | 165564 | BDIAG: JMP | @#DIAG       |                               |
| 000176 | 154747 |        | TTE: .WORD | 154747       | ;CRC WORD FOR LAST 63. WORDS. |
|        | 000001 |        | .END       |              |                               |

SYMBOL TABLE

|        |           |        |           |        |           |        |           |
|--------|-----------|--------|-----------|--------|-----------|--------|-----------|
| BDIAG  | 000172    | BIT8   | = 000400  | BIT9   | = 001000  | CFUDGE | 000016    |
| CRCWD  | = 000000  | DIAG   | = 165564  | HSR    | 000000    | HSRCR  | = 177550  |
| HSRE   | 000026    | HSRM   | 000012    | INITSW | = 173024  | LOAD   | 000050    |
| MRESER | = 173000  | PC     | = %000007 | RESERV | = 000340  | RK05CR | = 177404  |
| RK06CR | = 177440  | RL01CR | = 174400  | RP03CR | = 176714  | RP04CR | = 176700  |
| RS03CR | = 172040  | RS04CR | = 172040  | RX01CR | = 177170  | RX02CR | = 177170  |
| R0     | = %000000 | R1     | = %000001 | R2     | = %000002 | R3     | = %000003 |
| R4     | = %000004 | R5     | = %000005 | R6     | = %000006 | R7     | = %000007 |
| SP     | = %000006 | TT     | 000030    | TTCR   | = 177560  | TTE    | 000176    |
| TTM    | 000042    | TU10CR | = 172522  | TU16CR | = 172440  | TU56CR | = 177342  |
| .      | = 000200  |        |           |        |           |        |           |

.TITLE M9312 BOOTSTRAP ROM LISTING

THIS ROM WILL BOOT THE RK05 TU56 OPTION(S).

.SBTTL RK05 BOOT

TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS, THE START ADDR IS 173Y04.  
 TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS, THE START ADDR IS 173Y06.  
 THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.  
 IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX  
 IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.  
 IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.  
 IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

.SBTTL TU56 BOOT

THIS ROM WILL BOOT THE TU56 OPTION(S).  
 TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS, THE START ADDR IS 173Y34.  
 TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS, THE START ADDR IS 173Y36.  
 THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.  
 IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX  
 IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.  
 IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.  
 IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

.SBTTL ;RK05, TU56 BOOT  
 ;CMNDS "DK", "DT"

;RK05 BOOT. THIS BOOT READS DISK ADDR. 0,0 ON ERROR I.E. DRIVE  
 ; NOT READY, NO DISK, ETC, A SYSTEM INIT. IS ISSUED AND  
 ; THE BOOT IS RETRIED UNTIL A GOOD BOOT OCCURS  
 ; OR THE BOOT IS HALTED.

;TU56 BOOT. THIS BOOT READS BLOCK 0 FROM THE DEC TAPE ON ERROR  
 ; WE ISSUE A A SYSTEM INIT. THEN TRY TO REBOOT.  
 ; THIS RETRY WILL OCCUR UNTIL WE SUCCESSFULLY BOOT,  
 ; OR THE BOOT IS HALTED.  
 ;

000000 042113  
 000002 000026  
 000004 000261  
 000006 012700 000000  
 000012 012701 177404  
 000016 010704  
 000020 103057  
 000022 000426  
 000024 173000  
 000026 000340  
 000030 042124  
 000032 000146  
 000034 000261  
 000036 012700 000000  
 000042 012701 177342

RK05: .ASCII "KD" ;CMND "DK" RK05 BOOT.  
 .WORD <RK05E-.+2> ;OFFSET TO NEXT DEVICE BOOT.  
 SEC ;UNIT 0, NO DIAG. ENTRY POINT.  
 MOV #0,R0 ;UNIT 0, RUN DIAG. ENTRY POINT  
 RK05M: MOV #RK05CR,R1 ;LOAD CSR ADDR. INTO R1.  
 MOV PC,R4 ;ENTRY FROM CONSOLE EMULATOR.  
 BCC BDIAG ;EXERCISE DIAG. IF C=0  
 BR RK05B ;GOTO RK05 BOOT.  
 .WORD MRESERVED  
 RK05E: .WORD RESERVED  
 TU56: .ASCII "TD" ;CMND "DT" TU56 BOOT.  
 .WORD <TU56E-.+2> ;OFFSET TO NEXT DEVICE BOOT.  
 SEC ;UNIT 0, NO DIAG. ENTRY POINT.  
 MOV #R0,R0 ;UNIT 0, RUN DIAG. ENTRY POINT.  
 TU56M: MOV #TU56CR,R1 ;LOAD CSR ADDR. INTO R1

```

000046 010704      MOV      PC,R4      ;ENTRY FROM CONSOLE EMULATOR.
000050 103043      BCC      BDIAG      ;EXERCISE DIAG. IF C=0
000052 010003      MOV      R0,R3      ;FIX UNIT NUMBER IN R3
000054 000303      SWAB     R3        ;TU56 BOOT.
000056 010311      MOV      R3,(R1)    ;FIX UNIT NUMBER IN DEVICE.
000060 052711 004003  BIS      #4003,(R1)  ;SET REWIND
000064 005711      1$:      TST      (R1)    ;WAIT FOR END ZONE ERROR
000066 100376      BPL      1$
000070 005761 177776  TST      -2(R1)    ;LOOK FOR ERROR.
000074 010311      MOV      R3,(R1)    ;CLEAR DEVICE.
000076 000410      BR       CBOOT      ;GOTO COMMON BOOT.
000100 010003      RK05B:  MOV      R0,R3
000102 000241      CLC
000104 006003      ROR      R3        ;FIX UNIT NUMBER FOR DEVICE.
000106 006003      ROR      R3
000110 006003      ROR      R3
000112 006003      ROR      R3
000114 010361 000006  MOV      R3,6(R1)    ;SET UNIT NUMBER IN DEVICE
000120 012761 177000 000002  CBOOT:  MOV      #-512.,2(R1)  ;COMMON BOOT, SET WORD COUNT.
000126 052703 000005      BIS      #5,R3    ;PICK UP READ WORD.
000132 010311      MOV      R3,(1)    ;SET INTO DEVICE CSR.
000134 105711      1$:      TSTB     (R1)    ;WAIT FOR DEVICE DONE.
000136 100376      BPL      1$
000140 005711      TST      (R1)    ;TEST FOR DEVICE ERROR
000142 100003      BPL      GBOOT
000144 000005      ERROR:  RESET     ;ON ERROR, INITIALIZE SYSTEM
000146 000164 000002      JMP      2(R4)    ;RETURN TO START OF BOOT.
000152 042711 000377      GBOOT:  BIC      #377,(R1)  ;NO ERROR, CLEAR DEVICE
000156 005007      CLR      R7        ;GOTO SECONDARY MONITOR ADDR. OR
000160 000137 165564      BDIAG:  JMP      @#DIAG    ;GOTO DIAGNOSTIC IF C=0
                                ;RETURNS BASED ON ADDR. IN R4
                                ;*****
                                ;ENTRY POINT FOR RK05 UNIT #2,NO DIAGS RUN.
                                ;*****
000164 000261      SEC

                                ;*****
                                ;ENTRY POINT FOR RK05 UNIT #2, RUN DIAGS.
                                ;*****

000166 012700 000002      RK052:  MOV      #2,R0      ;ENTRY POINT FOR RK05 BOOT UNIT 2
000172 000707      BR       RK05M
                                .=176
000176 124650      TU56E:  .WORD     124650    ;CRC WORD FOR LAST 63. WORDS.
                                .END
000001

```

## SYMBOL TABLE

|        |          |        |          |        |          |        |          |
|--------|----------|--------|----------|--------|----------|--------|----------|
| BDIAG  | 000160   | BIT8   | = 000400 | BIT9   | = 001000 | CBOOT  | 000120   |
| CRCWD  | = 000000 | DIAG   | = 165564 | ERROR  | 000144   | GBOOT  | 000152   |
| HSRCR  | = 177550 | INITSW | = 173024 | MRESER | = 173000 | PC     | =%000007 |
| RESERV | = 000340 | RK05   | 000000   | RK05B  | 000100   | RK05CR | = 177404 |
| RK05E  | 000026   | RK05M  | 000012   | RK052  | 000166   | RK06CR | = 177440 |
| RL01CR | = 174400 | RP03CR | = 176714 | RP04CR | = 176700 | RS03CR | = 172040 |
| RS04CR | = 172040 | RX01CR | = 177170 | RX02CR | = 177170 | R0     | =%000000 |
| R1     | =%000001 | R2     | =%000002 | R3     | =%000003 | R4     | =%000004 |
| R5     | =%000005 | R6     | =%000006 | R7     | =%000007 | SP     | =%000006 |
| TTCR   | = 177560 | TU10CR | = 172522 | TU16CR | = 172440 | TU56   | 000030   |
| TU56CR | = 177342 | TU56E  | 000176   | TU56M  | 000042   | .      | = 000200 |

## M9312 BOOTSTRAP ROM LISTING

THIS ROM WILL BOOT THE RK06/RK07 OPTION(S).

TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS, THE START ADDR IS 173Y04.  
 TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS, THE START ADDR IS 173Y06.  
 THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.  
 IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX  
 IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.  
 IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.  
 IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

## .SBTTL RK06/RK07 BOOT

;RK06 BOOT. THIS BOOT BOOTS EITHER THE RK06 OR RK07 DRIVES.  
 ; IT FIRST TRIES TO BOOT SELECTED DRIVE AS A RK06.  
 ; IF WE GET A DRIVE TYPE ERROR AS A RESULT OF THAT TRY,  
 ; WE SET THE RK07 DRIVE TYPE IN THE RK611 CSR. AND TRY  
 ; TO BOOT THE SELECTED DRIVE AS A RK07.  
 ;  
 ; NOTE: DRIVE TYPE IS LEFT IN THE  
 ; CSR WHEN WE LEAVE THIS BOOT.

.SBTTL ;RK06/RK07  
 ;CMND = "DM"

|        |        |               |        |        |              |  |                                     |
|--------|--------|---------------|--------|--------|--------------|--|-------------------------------------|
| 000000 | 042115 |               | RK06:  | .ASCII | "MD"         |  | ;ID OF RK06,RK07 BOOT.              |
| 000002 | 000176 |               |        | .WORD  | <RK06E-.+2>  |  | ;OFFSET TO NEXT DEVICE BOOT.        |
| 000004 | 000261 |               |        | SEC    |              |  |                                     |
| 000006 | 012700 | 000000        |        | MOV    | #0,R0        |  |                                     |
| 000012 | 012701 | 177440        | RK06M: | MOV    | #RK06CR,R1   |  | ;LOAD DEVICE ADDR. INTO R1.         |
| 000016 | 010704 |               |        | MOV    | PC,R4        |  |                                     |
| 000020 | 103055 |               |        | BCC    | BDIAG        |  |                                     |
| 000022 | 000402 |               |        | BR     | RK06B        |  |                                     |
| 000024 | 173000 |               |        | .WORD  | MRESERVED    |  |                                     |
| 000026 | 000340 |               |        | .WORD  | RESERVED     |  |                                     |
| 000030 | 010061 | 000010        | RK06B: | MOV    | R0,10(R1)    |  |                                     |
| 000034 | 012711 | 000003        |        | MOV    | #3,(R1)      |  |                                     |
| 000040 | 105711 |               | 1\$:   | TSTB   | (R1)         |  |                                     |
| 000042 | 100376 |               |        | BPL    | 1\$          |  |                                     |
| 000044 | 005711 |               |        | TST    | (R1)         |  |                                     |
| 000046 | 100015 |               |        | BPL    | 3\$          |  | ;NO ERROR-THEN PROCEED.             |
| 000050 | 032761 | 000040 000014 |        | BIT    | #40,14(R1)   |  | ;THERE WAS AN ERROR,PUT DRIVE TYPE? |
| 000056 | 001426 |               |        | BEQ    | ERROR        |  | ;NO,INIT AND TRY AGAIN.             |
| 000060 | 000005 |               |        | RESET  |              |  | ;YES INIT AND TRY RK07 TYPE DRIVE.  |
| 000062 | 010061 | 000010        |        | MOV    | R0,10(R1)    |  | ;SET DRIVE NUMBER.                  |
| 000066 | 012711 | 002003        |        | MOV    | #002003,(R1) |  | ;SELECT RK07,PAC.                   |
| 000072 | 105711 |               | 2\$:   | TSTB   | (R1)         |  | ;WAIT FOR READY.                    |
| 000074 | 100376 |               |        | BPL    | 2\$          |  |                                     |
| 000076 | 005711 |               |        | TST    | (R1)         |  | ;LOOK FOR AN ERROR                  |
| 000100 | 100415 |               |        | BMI    | ERROR        |  | ;IF ERROR INIT TRY AGAIN.           |
| 000102 |        |               | 3\$:   |        |              |  | ;REGISTER INTO ITSELF.              |
| 000102 | 012761 | 177000 000002 | CB00T: | MOV    | #-512.,2(R1) |  | ;LOAD WORD COUNT                    |
| 000110 | 011103 |               |        | MOV    | (R1),R3      |  | ;READ DEVICE                        |
| 000112 | 042703 | 000377        |        | BIC    | #377,R3      |  | ;STRIP.                             |



```

000116 052703 000021      BIS      #21,R3      ;ADD READ CODE
000122 010311      MOV      R3,(R1)      ;START DEVICE
000124 105711      1$:      TSTB     (R1)      ;WAIT FOR READY
000126 100376      BPL      1$
000130 005711      TST      (1)      ;ANY ERROR?
000132 100003      BPL      GBOOT      ;NO ERROR, EXIT
000134 000005      ERROR:  RESET      ;INITIALIZE SYSTEM
000136 000164 000002      JMP      2(4)      ;RETRY BOOT.
000142      GBOOT:
000142 005007      START:  CLR      PC      ;STARTS LOADED CODE.

;*****
;ENTRY POINT FOR RK06,RK07 UNIT #1, NO DIAG.
;*****
000144 000261      SEC
;*****
;ENTRY POINT FOR RK06,RK07 UNIT #1, RUN DIAG.
;*****
000146 012700 000001      MOV      #1,R0
000152 000717      BR       RK06M
000154 000137 165564      BDIAG:  JMP      @#DIAG
000176 077161      RK06E:  .WORD    077161      ;CRC WORD FOR LAST 63. WORDS.
000001      .END

```

## SYMBOL TABLE

|        |           |        |           |        |           |        |           |
|--------|-----------|--------|-----------|--------|-----------|--------|-----------|
| BDIAG  | 000154    | BIT8   | = 000400  | BIT9   | = 001000  | CBOOT  | 000102    |
| CRCWD  | = 000000  | DIAG   | = 165564  | ERROR  | 000134    | GBOOT  | 000142    |
| HSRCR  | = 177550  | INITSW | = 173024  | MRESER | = 173000  | PC     | = %000007 |
| RESERV | = 000340  | RK05CR | = 177404  | RK06   | 000000    | RK06B  | 000030    |
| RK06CR | = 177440  | RK06E  | 000176    | RK06M  | 000012    | RL01CR | = 174400  |
| RP03CR | = 176714  | RP04CR | = 176700  | RS03CR | = 172040  | RS04CR | = 172040  |
| RX01CR | = 177170  | RX02CR | = 177170  | R0     | = %000000 | R1     | = %000001 |
| R2     | = %000002 | R3     | = %000003 | R4     | = %000004 | R5     | = %000005 |
| R6     | = %000006 | R7     | = %000007 | SP     | = %000006 | START  | 000142    |
| TTCR   | = 177560  | TU10CR | = 172522  | TU16CR | = 172440  | TU56CR | = 177342  |
| .      | = 000200  |        |           |        |           |        |           |

## M9312 BOOTSTRAP ROM LISTING

THIS ROM WILL BOOT THE RL01 OPTION(S).

TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS, THE START ADDR IS 173Y04.  
 TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS, THE START ADDR IS 173Y06.  
 THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.  
 IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX  
 IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.  
 IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.  
 IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

.SBTTL RL01 BOOT  
 ;CMND = "DL"

|        |        |        |        |        |        |              |  |                                     |
|--------|--------|--------|--------|--------|--------|--------------|--|-------------------------------------|
| 000000 | 042114 |        |        | RL01:  | .ASCII | "LD"         |  | ;ID OF RL11/RL01 BOOT.              |
| 000002 | 000176 |        |        |        | .WORD  | <RL01E-.+2>  |  | ;OFFSET TO NEXT DEVICE BOOT.        |
| 000004 | 000261 |        |        |        | SEC    |              |  | ;UNIT 0, NO DIAG. ENTRY POINT       |
| 000006 | 012700 | 000000 |        |        | MOV    | #0,R0        |  | ;UNIT 0, RUN DIAG. ENTRY POINT.     |
| 000012 | 012701 | 174400 |        | RL01M: | MOV    | #RL01CR,R1   |  | ;LOAD CSR ADDR. INTO R1             |
| 000016 | 010704 |        |        |        | MOV    | PC,R4        |  | ;ENTRY POINT FROM CONSOLE EMULATOR. |
| 000020 | 103064 |        |        |        | BCC    | BDIAG        |  | ;EXERCISE DIAG. FC=0                |
| 000022 | 000402 |        |        |        | BR     | 1\$          |  |                                     |
| 000024 | 173000 |        |        |        | .WORD  | MRESERVED    |  |                                     |
| 000026 | 000340 |        |        |        | .WORD  | RESERVED     |  |                                     |
| 000030 | 010003 |        |        | 1\$:   | MOV    | R0,R3        |  |                                     |
| 000032 | 000303 |        |        |        | SWAB   | R3           |  | ;ASSUME SYSTEM INIT ON ENTRY.       |
| 000034 | 010311 |        |        |        | MOV    | R3,(R1)      |  | ;SET UNIT NUMBER.                   |
| 000036 | 012761 | 000013 | 000004 |        | MOV    | #13,4(R1)    |  | ;CLEAR DRIVE ERROR.                 |
| 000044 | 052703 | 000004 |        |        | BIS    | #4,R3        |  |                                     |
| 000050 | 010311 |        |        |        | MOV    | R3,(R1)      |  | ;ISSUE GET STATUS.                  |
| 000052 | 105711 |        |        | 2\$:   | TSTB   | (R1)         |  | ;WAIT TILL DONE.                    |
| 000054 | 100376 |        |        |        | BPL    | 2\$          |  |                                     |
| 000056 | 105003 |        |        |        | CLRB   | R3           |  |                                     |
| 000060 | 052703 | 000010 |        |        | BIS    | #10,R3       |  | ;ISSUE A READ HEADER.               |
| 000064 | 010311 |        |        |        | MOV    | R3,(R1)      |  |                                     |
| 000066 | 105711 |        |        | 3\$:   | TSTB   | (R1)         |  | ;WAIT TILL DONE.                    |
| 000070 | 100376 |        |        |        | BPL    | 3\$          |  |                                     |
| 000072 | 016102 | 000006 |        |        | MOV    | 6(R1),R2     |  | ;GET HEADER.                        |
| 000076 | 042702 | 000077 |        |        | BIC    | #77,R2       |  | ;CLEAR SECTOR.                      |
| 000102 | 005202 |        |        |        | INC    | R2           |  |                                     |
| 000104 | 010261 | 000004 |        |        | MOV    | R2,4(R1)     |  | ;SET SEEK TO ZERO.                  |
| 000110 | 105003 |        |        |        | CLRB   | R3           |  |                                     |
| 000112 | 052703 | 000006 |        |        | BIS    | #6,R3        |  |                                     |
| 000116 | 010311 |        |        |        | MOV    | R3,(R1)      |  | ;DO SEEK.                           |
| 000120 | 105711 |        |        | 4\$:   | TSTB   | (R1)         |  | ;WAIT TILL DONE.                    |
| 000122 | 100376 |        |        |        | BPL    | 4\$          |  |                                     |
| 000124 | 005061 | 000004 |        |        | CLR    | 4(R1)        |  | ;CLEAR DISK ADDR.                   |
| 000130 | 012761 | 177000 | 000006 |        | MOV    | #-512.,6(R1) |  | ;SET WORD COUNT.                    |
| 000136 | 105003 |        |        |        | CLRB   | R3           |  |                                     |
| 000140 | 052703 | 000014 |        |        | BIS    | #14,R3       |  | ;READ DATA CMND.                    |
| 000144 | 010311 |        |        |        | MOV    | R3,(R1)      |  | ;ISSUE READ CMND.                   |
| 000146 | 105711 |        |        | 5\$:   | TSTB   | (R1)         |  | ;WAIT TILL DONE.                    |
| 000150 | 100376 |        |        |        | BPL    | 5\$          |  |                                     |
| 000152 | 005711 |        |        |        | TST    | (R1)         |  | ;LOOK FOR ERRORS.                   |

|        |        |        |              |           |                              |
|--------|--------|--------|--------------|-----------|------------------------------|
| 000154 | 100003 |        | BPL          | GBOOT     |                              |
| 000156 | 000005 |        | ERROR: RESET |           | ;SYSTEM INITIALIZE.          |
| 000160 | 000164 | 000002 | JMP          | 2(R4)     |                              |
| 000164 | 042711 | 000377 | GBOOT: BIC   | #377,(R1) | ;CLEAR RL01.                 |
| 000170 | 005007 |        | CLR          | R7        | ;GOTO SECONDARY BOOT.        |
| 000172 | 000137 | 165564 | BDIAG: JMP   | @#DIAG    |                              |
|        | 000176 |        | . =176       |           |                              |
| 000176 | 174540 |        | RL01E: .WORD | 174540    | ;CRC WORD FOR LAST 63.WORDS. |
|        | 000001 |        | .END         |           |                              |

SYMBOL TABLE

|        |           |        |           |        |           |        |           |
|--------|-----------|--------|-----------|--------|-----------|--------|-----------|
| BDIAG  | 000172    | BIT8   | = 000400  | BIT9   | = 001000  | CRCWD  | = 000000  |
| DIAG   | = 165564  | ERROR  | 000156    | GBOOT  | 000164    | HSRCR  | = 177550  |
| INITSW | = 173024  | MRESER | = 173000  | PC     | = %000007 | RESERV | = 000340  |
| RK05CR | = 177404  | RK06CR | = 177440  | RL01   | 000000    | RL01CR | = 174400  |
| RL01E  | 000176    | RL01M  | 000012    | RP03CR | = 176714  | RP04CR | = 176700  |
| RS03CR | = 172040  | RS04CR | = 172040  | RX01CR | = 177170  | RX02CR | = 177170  |
| R0     | = %000000 | R1     | = %000001 | R2     | = %000002 | R3     | = %000003 |
| R4     | = %000004 | R5     | = %000005 | R6     | = %000006 | R7     | = %000007 |
| SP     | = %000006 | TTCR   | = 177560  | TU10CR | = 172522  | TU16CR | = 172440  |
| TU56CR | = 177342  | .      | = 000200  |        |           |        |           |

## M9312 BOOTSTRAP ROM LISTING

THIS ROM WILL BOOT THE RS03 OPTION(S).

TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS, THE START ADDR IS 173Y04.  
 TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS, THE START ADDR IS 173Y06.  
 THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.  
 IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX  
 IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.  
 IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.  
 IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

```

.SBTTL RS03 BOOT
;CMND DS

000000 042123 RS03: .ASCII 'SD' ;IDENTIFIER 'DS' FOR RS03 BOOT.
000002 000176 .WORD <RS03E-.+2> ;OFFSET TO NEXT ROM.
000004 000261 SEC ;ENTRY FOR UNIT 0, NO CPU DIAG RUN.
000006 012700 000000 MOV #0,R0 ;ENTRY FOR UNIT 0, RUN CPU DIAG.
000012 012701 172040 RS03M: MOV #RS03CR,R1 ;PUT ADDR. OF CSR INTO R1.
000016 010704 MOV PC,R4 ;GET RETURN ADDR.,
000020 103026 BCC BDIAG ;GOTO DIAG IF ENABLED(C=0).
000022 000402 BR 1$
000024 173000 .WORD MRESERVED
000026 000340 .WORD RESERVED
000030 010003 1$: MOV R0,R3
000032 010361 000010 RS03B: MOV R3,10(R1) ;SET UNIT NUMBER
000036 016161 000016 000016 MOV 16(R1),16(R1) ;WRITE ATTENTION FLAGS.
000044 012761 177000 000002 MOV #-512.,2(R1) ;SET WORD COUNT.
000052 012711 000071 MOV #71,(R1) ;SET COMMAND READ.
000056 105711 1$: TSTB (R1) ;WAIT TILL READY.
000060 100376 BPL 1$
000062 005711 TST (R1) ;LOOK FOR ERRORS.,
000064 100401 BMI ERROR ;IF ERROR, TAKE CARE OF IT.
000066 005007 CLR R7 ;ELSE EXIT TO LOADED CODE.,
000070 000005 ERROR: RESET ;INIT SYSTEM.
000072 000164 000002 JMP 2(R4)
000076 000137 165564 BDIAG: JMP @#DIAG ;GOTO DIAGNOSTICS
;RETURN MADE THROU ADDR. IN R4.

000176 126075 RS03E: .WORD 126075 ;CRC16 WORD FOR LAST 63. WORDS.
000001 .END

```

## SYMBOL TABLE

|        |           |        |           |        |           |        |           |
|--------|-----------|--------|-----------|--------|-----------|--------|-----------|
| BDIAG  | 000076    | BIT8   | = 000400  | BIT9   | = 001000  | CRCWD  | = 000000  |
| DIAG   | 165564    | ERROR  | 000070    | HSRCR  | = 177550  | INITSW | = 173024  |
| MRESER | = 173000  | PC     | = %000007 | RESERV | = 000340  | RK05CR | = 177404  |
| RK06CR | = 177440  | RL01CR | = 174400  | RP03CR | = 176714  | RP04CR | = 176700  |
| RS03   | 000000    | RS03B  | 000032    | RS03CR | = 172040  | RS03E  | 000176    |
| RS03M  | 000012    | RS04CR | = 172040  | RX01CR | = 177170  | RX02CR | = 177170  |
| R0     | = %000000 | R1     | = %000001 | R2     | = %000002 | R3     | = %000003 |
| R4     | = %000004 | R5     | = %000005 | R6     | = %000006 | R7     | = %000007 |
| SP     | = %000006 | TTCH   | = 177560  | TU10CR | = 172522  | TU16CR | = 172440  |
| TU56CR | = 177342  | .      | = 000200  |        |           |        |           |

## M9312 BOOTSTRAP ROM LISTING

THIS ROM WILL BOOT THE RX01 OPTION(S).

TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS, THE START ADDR IS 173Y04.  
 TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS, THE START ADDR IS 173Y06.  
 THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.  
 IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX  
 IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.  
 IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.  
 IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

.SBTTL RX01 BOOT  
 ;CMND "DX"

; THIS BOOT READ TRACK 1, SECTOR 1 OFF DISK. IT CAN ONLY LOOK AT  
 ; DRIVE 0 OR DRIVE 1.  
 ; IF ANY ERROR IS ENCONTERED I.E. DRIVE OFF LINE, NO DISK, ETC,  
 ; A SYSTEM INIT. IS ISSUED AND WE TRY AGAIN TO REBOOT THE DISK.  
 ;

|        |        |               |        |        |              |  |                              |
|--------|--------|---------------|--------|--------|--------------|--|------------------------------|
| 000000 | 042130 |               | RX01:  | .ASCII | "XD"         |  | ;CMND "DX" RX01 BOOT.        |
| 000002 | 000176 |               |        | .WORD  | <RX01E-.+2>  |  | ;OFFSET TO NEXT DEVICE BOOT. |
| 000004 | 000261 |               |        | SEC    |              |  | ;UNIT 0, NO DIAG             |
| 000006 | 012700 | 000000        |        | MOV    | #0,R0        |  | ;UNIT 0 RUN                  |
| 000012 |        |               | RX01M: |        |              |  | ;ENTRY FROM CONSOLE EMULATOR |
| 000012 | 012701 | 177170        |        | MOV    | #RX01CR,R1   |  | ;GET CSR ADDR TO R1          |
| 000016 | 010704 |               |        | MOV    | PC,R4        |  |                              |
| 000020 | 103056 |               |        | BCC    | BDIAG        |  | ;EXERCISE DIAG. IF C=D       |
| 000022 | 000402 |               |        | BR     | 1\$          |  |                              |
| 000024 | 173000 |               |        | .WORD  | MRESERVED    |  | ;                            |
| 000026 | 000340 |               |        | .WORD  | RESERVED     |  | ;                            |
| 000030 | 000241 |               | 1\$:   | CLC    |              |  |                              |
| 000032 | 012703 | 001407        | RX01B: | MOV    | #1407,R3     |  |                              |
| 000036 | 132700 | 000001        |        | BITB   | #1,R0        |  |                              |
| 000042 | 001402 |               |        | BEQ    | 1\$          |  |                              |
| 000044 | 012703 | 011427        |        | MOV    | #11427,R3    |  |                              |
| 000050 | 132711 | 100040        | 1\$:   | BITB   | #100040,(R1) |  | ;IS DONE BIT SET?            |
|        |        |               |        |        |              |  | ;                            |
| 000054 | 001775 |               |        | BEQ    | 1\$          |  |                              |
| 000056 | 110311 |               |        | MOVB   | R3,(R1)      |  | ;LOAD READ CMND.             |
| 000060 | 111105 |               | 2\$:   | MOVB   | (R1),R5      |  | ;IS 'TR' BIT SET?            |
| 000062 | 100376 |               |        | BPL    | 2\$          |  |                              |
| 000064 | 112761 | 000001 000002 |        | MOVB   | #1,2(R1)     |  | ;LOAD TRACK,SECTOR ADDR.     |
| 000072 | 106003 |               |        | RORB   | R3           |  |                              |
| 000074 | 102771 |               |        | BVS    | 2\$          |  |                              |
| 000076 | 032711 | 100040        | 3\$:   | BIT    | #100040,(R1) |  | ;WAIT FOR ERROR OR DONE.     |
| 000102 | 001775 |               |        | BEQ    | 3\$          |  |                              |
| 000104 | 100412 |               |        | BMI    | ERROR        |  |                              |
| 000106 | 000303 |               |        | SWAB   | R3           |  |                              |
| 000110 | 110311 |               |        | MOVB   | R3,(R1)      |  |                              |
| 000112 | 005003 |               |        | CLR    | R3           |  |                              |
| 000114 | 105711 |               | 4\$:   | TSTB   | (R1)         |  |                              |
| 000116 | 100376 |               |        | RPL    | 4\$          |  |                              |
| 000120 | 116123 | 000002        |        | MOVB   | 2(R1),(R3)+  |  |                              |

```
000124 105703          TSTB   R3          ;ALL DONE READS?
000126 100372          BPL     4$          ;NO GET NEXT BYTE
000130 005007          CLR     PC          ;START CODE
000132 000005          ERROR: RESET
000134 000140 012700 000001 M1:   MOV     #1,R0          ;ENTER HERE TO BOOT
                                ;UNIT #1 WITHOUT DIAG.
000144 000261          ;
000146 000721          BR      RX01M
000150 012700 000001 M2:   MOV     #1,R0          ;ENTER HERE TO BOOT
                                ;UNIT #1 WITH DIAG. RUN.
000154 000716          ;
000156 000137 165564 BDIAG: JMP     @#DIAG
000176 105572          RX01E: .WORD 105572
                                .END
```

SYMBOL TABLE

|        |           |        |           |        |           |        |           |
|--------|-----------|--------|-----------|--------|-----------|--------|-----------|
| BDIAG  | 000156    | BIT8   | = 000400  | BIT9   | = 001000  | CRCWD  | = 000000  |
| DIAG   | = 165564  | ERROR  | 000132    | HSRCR  | = 177550  | INITSW | = 173024  |
| MRESER | = 173000  | M1     | 000140    | M2     | 000150    | PC     | = %000007 |
| RESERV | = 000340  | RK05CR | = 177404  | RK06CR | = 177440  | RL01CR | = 174400  |
| RP03CR | = 176714  | RP04CR | = 176700  | RS03CR | = 172040  | RS04CR | = 172040  |
| RX01   | 000000    | RX01B  | 000032    | RX01CR | = 177170  | RX01E  | 000176    |
| RX01M  | 000012    | RX02CR | = 177170  | R0     | = %000000 | R1     | = %000001 |
| R2     | = %000002 | R3     | = %000003 | R4     | = %000004 | R5     | = %000005 |
| R6     | = %000006 | R7     | = %000007 | SP     | = %000006 | TTCR   | = 177560  |
| TU10CR | = 172522  | TU16CR | = 172440  | TU56CR | = 177342  | .      | = 000200  |

```
.TITLE M9312 BOOTSTRAP ROM LISTING
.REM %
```

```
COPYRIGHT (C) 1977,1978
DIGITAL EQUIPMENT CORP.
MAYNARD, MASS. 01754
```

```
PROGRAM BY EDWARD C. BADGER
```

```
;THIS BOOT BOOTS THE RX02 FLOOPY DISK FORM COMMAND "DY"
;
;THE SECONDDAY BOOT MUST BE IN DISK TRACK 1
;SECTORS 1,3,5, AND 7 IF ANY SECTOR IS UNSED,IT STILL WILL BE READ.
;NOTE : SINGLE DENSITY WILL BOOT 256 WORDS STARTING AT
;      LOC 0
;
;      LOC 0.
;
;      ;DOUBLE DENSITY WILL BOOT 1000 WORDS,STARTING
```

```
THIS ROM WILL BOOT THE RX02 OPTION(S).
TO BOOT UNIT 0,AND NOT RUN DIAGNOSTICS,THE START ADDR IS 173Y04.
TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS,THE START ADDR IS 173Y06.
THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.
IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX
IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.
IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.
IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.
```

```
.SBTTL RX02 BOOT
```

```
000000 042131      .ASCII "YD"      ;ASSCI IDENTIFIER FOR THIS BOOT "DY"
000002 000176      .WORD <RX02E-.+2> ;OFFFSET TO NEXT DEVICE BOOT.
000004 000261      SEC              ;ENTRY POINT FOR NOT DIAG RUN.
000006 012700 000000 MOV #0,R0      ;ENTRY POINT TO RUN DIAG.
000012 012701 177170 MOV #RX02CR,R1 ;PUT CSR ADDR. IN R1
000016 010704      L6: MOV PC,R4     ;RECORD BOOT ADDR.
000020 103064      BCC BDIAG        ;IF ENABLED ,RUN DIAG.
000022 000402      BR 1$            ;CONTINUE PAST POWER UP RESERVED LCO
000024 173000      .WORD MRESERVED  ;POWER UP HERE FOR NEW PC.
000026 000340      .WORD RESERVED   ;POWER UP HERE FOR NOW STATUS WORD
000030      1$:
000030 005103      L62: COM R3        ;CHANGE STATE OF DENSITY BIT.
000032 000005      RESET           ;SYSTEM INITAILIZE.
000034 012704 000401 MOV #401,R4     ;TRACK,SECTOR INFO.
000040 005002      L7: CLR R2        ;START ADDR. 0
000042 012705 000200 MOV #200,R5     ;IF ALREADY SET,CLEAR IT.
000046 042703 177377 BIC #~C<BIT8>,R3 ;CLEAR OUT ALL BUT DENSITY INFORMATION.
000052 001001      BNE LL6         ;IF SET,DOUBLE DENSITY.
000054 006205      ASP R5          ;IF CLEAR, IT WAS SINGLE DENSITY,MUST
000056      LL6:                  ;HALF THE WORD COUNT.
000056      LL:
000056 050700      BIS PC,R0        ;R0 WILL CONTAIN EITHER A ZERO OR A ONE.
                                         ;BY ADDING THE PC AND THE NEXT OFFSET,WE
                                         ;COME UP WITH THHE ADDRESS OF THE BYTE THAT
                                         ;CONTAINS THE START CODE FOR EITHER UNIT 0
```

|        |        |        |         |                  |                                                    |
|--------|--------|--------|---------|------------------|----------------------------------------------------|
| 000060 | 156003 | 000036 | BISB    | READ-.(R0),R3    | ;OR UNIT ONE.                                      |
| 000064 | 040700 |        | BIC     | PC,R0            | ;READ EITHER "007" FOR UNIT 0 OR "027" FOR UNIT 1. |
| 000066 | 010706 |        | MOV     | PC,R6            | ;RESTORE R0 TO UNIT NUMBER.                        |
| 000070 | 000423 |        | BR      | WAIT             | ;RECORD WHERE WE ARE FOR RETURN.                   |
| 000072 | 000432 |        | BR      | RDDY             | ;WAIT UNIT IS READY.                               |
| 000074 | 000416 |        | BR      | WAITS            | ;SET READ SECTOR                                   |
| 000076 | 000415 |        | BR      | WAITS            | ;GIVE SECOTR INFORAMATION.                         |
| 000100 | 000425 |        | BR      | EMPTY            | ;GIVE TRACK INFORMATION.                           |
| 000102 | 000430 |        | BR      | WAITD            |                                                    |
| 000104 | 000407 |        | BR      | WAITD2           | ;GIVE WORD COUNT                                   |
| 000106 | 060502 |        | ADD     | R5,R2            | ;GIVE CURRENT ADDR.                                |
| 000110 | 060502 |        | ADD     | R5,R2            | ;UPDATE CUURRENT ADDR.                             |
| 000112 | 122424 |        | CMPB    | (R4)+,(R4)+      | ;UPDATE SECTOR NUMBER.                             |
| 000114 | 120427 |        | CMPB    | R4,(PC)+         | ;IF THE LAST SECTOR IS #7,READ                     |
|        |        |        |         |                  | ;ONE MORE SECTOR. IF GREATOR (OCTAL 11) THEN       |
|        |        |        |         |                  | ;THEN WE'LL EXIT.                                  |
| 000116 | 007    | 027    | READ:   | .BYTE 7,27       | ;THE #7 IN LOWER BYTE FOR LAST INSTR. AND          |
|        |        |        |         |                  | ;THESE LOCATIONS ALSO USED BY PREVIOUS             |
|        |        |        |         |                  | ;INSTR. AS DATA FOR UNIT 1 OR UNIT 2               |
|        |        |        |         |                  | ;READ SECTOR WITH UNIT NUMBER.                     |
| 000120 | 003756 |        | BLE     | LL               | ;READS SECTORS 1,3,5,7                             |
| 000122 | 005007 |        | CLR     | R7               | ;EXIT TO LOC ZERO                                  |
| 000124 | 010261 | 000002 | WAITD2: | MOV R2,2(R1)     | ;LOAD CURRENT ADDR.                                |
| 000130 | 000403 |        | BR      | WAIT             |                                                    |
| 000132 | 110461 | 000002 | WAITS:  | MOVB R4,2(R1)    | ;LOAD TRACK OR SECTOR INFO.                        |
| 000136 | 000304 |        | SWAB    | R4               |                                                    |
| 000140 | 032711 | 100240 | WAIT:   | BIT #100240,(R1) | ;LOOK FOR ERROR,T/R OR DONE.                       |
| 000144 | 001775 |        | BEQ     | WAIT             | ;IF NONE,LOOP                                      |
| 000146 | 100730 |        | BMI     | L62              | ;IF ERROR,RESART.                                  |
| 000150 | 005726 |        | TST     | (6)+             | ;FIX REURN ADDR.                                   |
| 000152 | 000116 |        | JMP     | (6)              | ;RETURN FROM WHERE YE CAME.                        |
| 000154 | 042703 | 000004 | EMPTY:  | BIC #4,R3        |                                                    |
| 000160 | 010311 |        | RDDY:   | MOV R3,(R1)      |                                                    |
| 000162 | 000766 |        | BR      | WAIT             |                                                    |
| 000164 | 110561 | 000002 | WAITD:  | MOVB R5,2(R1)    | ;STORE WORD COUNT IN DBR                           |
| 000170 | 000763 |        | BR      | WAIT             | ;WAIT TILL DONE.                                   |
| 000172 | 000137 | 165564 | BDIAG:  | JMP @#DIAG       |                                                    |
| 000176 | 057141 |        | RX02E:  | .WORD 057141     | ;CRC-16 WORD FOR THIS BOOOT.                       |
|        | 000001 |        | .END    |                  |                                                    |

## SYMBOL TABLE

|        |           |        |           |        |           |        |           |
|--------|-----------|--------|-----------|--------|-----------|--------|-----------|
| BDIAG  | 000172    | BIT8   | = 000400  | BIT9   | = 001000  | CRCWD  | = 000000  |
| DIAG   | = 165564  | EMPTY  | 000154    | HSCR   | = 177550  | INITSW | = 173024  |
| LL     | 000056    | LL6    | 000056    | L6     | 000016    | L62    | 000030    |
| L7     | 000040    | MRESER | = 173000  | PC     | = %000007 | RDDY   | 000160    |
| READ   | 000116    | RESERV | = 000340  | RK05CR | = 177404  | RK06CR | = 177440  |
| RL01CR | = 174400  | RP03CR | = 176714  | RP04CR | = 176700  | RS03CR | = 172040  |
| RS04CR | = 172040  | RX01CR | = 177170  | RX02CR | = 177170  | RX02E  | 000176    |
| R0     | = %000000 | R1     | = %000001 | R2     | = %000002 | R3     | = %000003 |
| R4     | = %000004 | R5     | = %000005 | R6     | = %000006 | R7     | = %000007 |
| SP     | = %000006 | TTCR   | = 177560  | TU10CR | = 172522  | TU16CR | = 172440  |
| TU56CR | = 177342  | WAIT   | 000140    | WAITD  | 000164    | WAITD2 | 000124    |
| WAITS  | 000132    | .      | = 000200  |        |           |        |           |



## M9312 BOOTSTRAP ROM LISTING

THIS ROM WILL BOOT THE TU10 OPTION(S).

TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS, THE START ADDR IS 173Y04.  
 TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS, THE START ADDR IS 173Y06.  
 THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.  
 IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX  
 IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.  
 IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.  
 IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

%  
 .SBTTL ;TU10 BOOT           BOOTS UNITS 0,1,OR 2  
           ;CMND = MT       WITH OR WITHOUT DIAGNOSTICS

|        |        |        |        |        |              |  |                                        |
|--------|--------|--------|--------|--------|--------------|--|----------------------------------------|
| 000000 | 046524 |        | TU10:  | .ASCII | "TM"         |  | ;TM11/TU10 BOOT                        |
| 000002 | 000176 |        |        | .WORD  | <TU10E-.+2>  |  | ;OFFSET TO NEXT DEVICE BOOT.           |
| 000004 | 000261 |        |        | SEC    |              |  | ;ENTRY POINT TO UNIT 0 NO DIAG.        |
| 000006 | 012700 | 000000 |        | MOV    | #0,R0        |  | ;ENTRY POINT TO DIAGNOSTICS            |
| 000012 | 012701 | 172522 | TU10M: | MOV    | #TU10CR,R1   |  | ;LOAD CSR ADDR INTO R1.                |
| 000016 | 010704 |        |        | MOV    | PC,R4        |  | ;ENTRY POINT                           |
| 000020 | 103054 |        |        | BCC    | BDIAG        |  |                                        |
| 000022 | 000411 |        |        | BR     | 1\$          |  | ;GOTO BOOT.                            |
| 000024 | 173000 |        |        | .WORD  | MRESERVED    |  |                                        |
| 000026 | 000340 |        |        | .WORD  | RESERVED     |  |                                        |
| 000030 | 012700 | 000001 |        | MOV    | #1,R0        |  | ;START UNIT #1 DIAGNOSTICS             |
| 000034 | 000766 |        |        | BR     | TU10M        |  |                                        |
| 000036 | 012700 | 000001 |        | MOV    | #1,R0        |  | ;START UNIT #1 NO DIAGNOSTICS          |
| 000042 | 000261 |        |        | SEC    |              |  |                                        |
| 000044 | 000762 |        |        | BR     | TU10M        |  |                                        |
| 000046 | 010003 |        | 1\$:   | MOV    | R0,R3        |  |                                        |
| 000050 | 000303 |        | TU10B: | SWAB   | R3           |  |                                        |
| 000052 | 010311 |        |        | MOV    | R3,(R1)      |  | ;FIX UNIT #                            |
| 000054 | 006061 | 177776 | 1\$:   | ROR    | -2(R1)       |  | ;SEE IF THE SELECTED DRIVE IS ON LINE  |
| 000060 | 103375 |        |        | BCC    | 1\$          |  | ;WAIT IF NOT.                          |
| 000062 | 052711 | 060017 | 2\$:   | BIS    | #60017,(R1)  |  | ;REWIND, 800 BPI 9 CHANNEL             |
| 000066 | 105711 |        | 3\$:   | TSTB   | (R1)         |  | ;WAIT TILL DONE                        |
| 000070 | 100376 |        |        | BPL    | 3\$          |  |                                        |
| 000072 | 012761 | 177777 |        | MOV    | #-1,2(R1)    |  | ;SET RECORD COUNTER TO SKIP ONE RECORD |
| 000100 | 112711 | 000011 |        | MOVB   | #11,(R1)     |  | ;SPACE FORWARD CMND.                   |
| 000104 | 105711 |        | 4\$:   | TSTB   | (R1)         |  | ;WAIT FOR ERROR OR READY               |
| 000106 | 100376 |        |        | BPL    | 4\$          |  |                                        |
| 000110 | 005711 |        |        | TST    | (R1)         |  | ;SEE IF ERROR                          |
| 000112 | 100415 |        |        | BMI    | ERROR        |  |                                        |
| 000114 | 012761 | 177000 | CB00T: | MOV    | #-512.,2(R1) |  | ;LOAD WORD COUNT                       |
| 000122 | 011103 |        |        | MOV    | (R1),R3      |  | ;SET READ                              |
| 000124 | 042703 | 000377 |        | BIC    | #377,R3      |  |                                        |
| 000130 | 152703 | 000003 |        | BISB   | #3,R3        |  |                                        |
| 000134 | 010311 |        |        | MOV    | R3,(R1)      |  |                                        |
| 000136 | 105711 |        | 1\$:   | TSTB   | (1)          |  | ;WAIT TILL DONE                        |
| 000140 | 100376 |        |        | BPL    | 1\$          |  |                                        |
| 000142 | 005711 |        |        | TST    | (R1)         |  | ;TEST FOR ERRORS.                      |
| 000144 | 100004 |        |        | BPL    | GB00T        |  | ;NO - ERROR - EXIT.                    |

|        |        |        |        |       |           |  |  |  |  |
|--------|--------|--------|--------|-------|-----------|--|--|--|--|
| 000146 | 000005 |        | ERROR: | RESET |           |  |  |  |  |
| 000150 | 000720 |        |        | BR    | TU10M     |  |  |  |  |
| 000152 | 000137 | 165564 | BDIAG: | JMP   | @#DIAG    |  |  |  |  |
| 000156 | 042711 | 000377 | GBOOT: | BIC   | #377,(R1) |  |  |  |  |
| 000162 | 005007 |        |        | CLR   | PC        |  |  |  |  |
|        | 000176 |        |        | .=176 |           |  |  |  |  |
| 000176 | 021526 |        | TU10E: | .WORD | 021526    |  |  |  |  |
|        | 000001 |        |        | .END  |           |  |  |  |  |

;ELSE, INITIALIZE, TRY AGAIN.  
;CLEAR CONTROLLER.  
;GO TO SECONDARY BOOT.

## SYMBOL TABLE

|        |           |        |           |        |           |        |           |
|--------|-----------|--------|-----------|--------|-----------|--------|-----------|
| BDIAG  | 000152    | BIT8   | = 000400  | BIT9   | = 001000  | CBOOT  | 000114    |
| CRCWD  | = 000000  | DIAG   | = 165564  | ERROR  | 000146    | GBOOT  | 000156    |
| HSRCR  | = 177550  | INITSW | = 173024  | MRESER | = 173000  | PC     | = %000007 |
| RESERV | = 000340  | RK05CR | = 177404  | RK06CR | = 177440  | RL01CR | = 174400  |
| RP03CR | = 176714  | RP04CR | = 176700  | RS03CR | = 172040  | RS04CR | = 172040  |
| RX01CR | = 177170  | RX02CR | = 177170  | R0     | = %000000 | R1     | = %000001 |
| R2     | = %000002 | R3     | = %000003 | R4     | = %000004 | R5     | = %000005 |
| R6     | = %000006 | R7     | = %000007 | SP     | = %000006 | TTCR   | = 177560  |
| TU10   | 000000    | TU10B  | 000050    | TU10CR | = 172522  | TU10E  | 000176    |
| TU10M  | 000012    | TU16CR | = 172440  | TU56CR | = 177342  | .      | = 000200  |

## M9312 BOOTSTRAP ROM LISTING

THIS ROM WILL BOOT THE TU16/TU77 OPTION(S).

TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS, THE START ADDR IS 173Y04.  
 TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS, THE START ADDR IS 173Y06.  
 THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.  
 IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX  
 IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.  
 IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.  
 IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

%

.SBTTL ;TU16/TU77 BOOT  
 ;CMND = "MM"

|        |        |        |        |          |        |               |  |                                  |
|--------|--------|--------|--------|----------|--------|---------------|--|----------------------------------|
| 000000 | 046515 |        |        | TU16:    | .ASCII | "MM"          |  | ;TU16 BOOT.                      |
| 000002 | 000176 |        |        |          | .WORD  | <TU16E-.+2>   |  | ;OFFSET TO NEXT DEVICE BOOT.     |
| 000004 | 000261 |        |        |          | SEC    |               |  | ;UNIT ZERO ENTRY                 |
| 000006 | 012700 | 000000 |        |          | MOV    | #0,R0         |  |                                  |
| 000012 | 012701 | 172440 |        | TU16M:   | MOV    | #TU16CR,R1    |  | ;LOAD CSR ADDR. INTO R1          |
| 000016 | 010704 |        |        |          | MOV    | PC,R4         |  |                                  |
| 000020 | 103064 |        |        |          | BCC    | BDIAG         |  |                                  |
| 000022 | 000402 |        |        |          | BR     | TU16B         |  |                                  |
| 000024 | 173000 |        |        |          | .WORD  | MRESERVED     |  |                                  |
| 000026 | 000340 |        |        |          | .WORD  | RESERVED      |  |                                  |
| 000030 |        |        |        | TU16B:   |        |               |  |                                  |
| 000030 | 000005 |        |        | TU16ER:  | RESET  |               |  |                                  |
| 000032 | 010003 |        |        |          | MOV    | R0,R3         |  |                                  |
| 000034 | 052703 | 001300 |        |          | BIS    | #1300,R3      |  | ;800 BPI AND FORMAT              |
| 000040 | 010361 | 000032 |        |          | MOV    | R3,32(R1)     |  |                                  |
| 000044 | 032761 | 010000 | 000012 | 1\$:     | BIT    | #10000,12(R1) |  |                                  |
| 000052 | 001774 |        |        |          | BEQ    | 1\$           |  |                                  |
| 000054 | 112711 | 000007 |        |          | MOVB   | #7,(R1)       |  | ;REWIND COMMAND                  |
| 000060 | 105761 | 000012 |        | 2\$:     | TSTB   | 12(R1)        |  |                                  |
| 000064 | 100375 |        |        |          | BPL    | 2\$           |  |                                  |
| 000066 | 112711 | 000011 |        |          | MOVB   | #11,(R1)      |  | ;DRIVE CLEAR CMND.               |
| 000072 | 105761 | 000012 |        | 3\$:     | TSTB   | 12(R1)        |  |                                  |
| 000076 | 100375 |        |        |          | BPL    | 3\$           |  |                                  |
| 000100 | 012761 | 177777 | 000006 |          | MOV    | #-1,6(R1)     |  |                                  |
| 000106 | 112711 | 000031 |        |          | MOVB   | #31,(R1)      |  | ;SPACE FORWARD CMND.             |
| 000112 | 105761 | 000012 |        | 4\$:     | TSTB   | 12(R1)        |  |                                  |
| 000116 | 100375 |        |        |          | BPL    | 4\$           |  |                                  |
| 000120 | 016161 | 000016 | 000016 |          | MOV    | 16(R1),16(R1) |  |                                  |
| 000126 | 012761 | 177000 | 000002 | CMM\$GO: | MOV    | #-512.,2(R1)  |  |                                  |
| 000134 | 011103 |        |        |          | MOV    | (R1),R3       |  |                                  |
| 000136 | 042703 | 000377 |        |          | BIC    | #377,R3       |  |                                  |
| 000142 | 152703 | 000071 |        |          | BISB   | #71,R3        |  | ;READ CMND                       |
| 000146 | 010311 |        |        |          | MOV    | R3,(R1)       |  |                                  |
| 000150 | 105711 |        |        | 1\$:     | TSTB   | (R1)          |  |                                  |
| 000152 | 100376 |        |        |          | BPL    | 1\$           |  |                                  |
| 000154 | 005711 |        |        |          | TST    | (R1)          |  |                                  |
| 000156 | 100004 |        |        |          | BPL    | CLCRS         |  |                                  |
| 000160 | 022761 | 001000 | 000014 |          | CMP    | #1000,14(R1)  |  | ;PATTERN TO TEST FRAME ERROR BIT |
| 000166 | 001320 |        |        |          | BNE    | TU16ER        |  |                                  |

```
000170 005007
000172 000137 165564
000176 000176
000176 162556
000001 000001

CLCRS: CLR PC
BDIAG: JMP @#DIAG
        .=176
TU16E: .WORD 162556
        .END
```

SYMBOL TABLE

|         |          |         |          |         |          |         |          |
|---------|----------|---------|----------|---------|----------|---------|----------|
| BDIAG   | 000172   | BIT8    | = 000400 | BIT9    | = 001000 | CLCRS   | 000170   |
| CMM\$GO | 000126   | CRCWD   | = 000000 | DIAG    | = 165564 | HSRCR   | = 177550 |
| INITSW= | 173024   | MRESER= | 173000   | PC      | =%000007 | RESERV= | 000340   |
| RK05CR= | 177404   | RK06CR= | 177440   | RL01CR= | 174400   | RP03CR= | 176714   |
| RP04CR= | 176700   | RS03CR= | 172040   | RS04CR= | 172040   | RX01CR= | 177170   |
| RX02CR= | 177170   | R0      | =%000000 | R1      | =%000001 | R2      | =%000002 |
| R3      | =%000003 | R4      | =%000004 | R5      | =%000005 | R6      | =%000006 |
| R7      | =%000007 | SP      | =%000006 | TTCR    | = 177560 | TU10CR= | 172522   |
| TU16    | 000000   | TU16B   | 000030   | TU16CR= | 172440   | TU16E   | 000176   |
| TU16ER  | 000030   | TU16M   | 000012   | TU56CR= | 177342   | .       | = 000200 |

## M9312 BOOTSTRAP ROM LISTING

THIS ROM WILL BOOT THE TU60 OPTION(S).

TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS, THE START ADDR IS 173Y04.  
 TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS, THE START ADDR IS 173Y06.  
 THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.  
 IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX  
 IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.  
 IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.  
 IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

%  
 .SBTTL ;THIS TA-11, TU60 CASSETTE BOOT.  
 ;CMMD = CT

|        |        |        |            |                          |                                |
|--------|--------|--------|------------|--------------------------|--------------------------------|
| 000000 | 041524 |        | TA11:      | .ASCII "TC"              | ;TU60 BOOT ID "CT"             |
| 000002 | 000176 |        |            | .WORD <TA11E-.+2>        | ;OFFSET TO NEXT DEVICE BOOT.   |
| 000004 | 000261 |        |            | SEC                      | ;UNIT #0 ENTRY, NO DIAG        |
| 000006 | 012700 | 000000 |            | MOV #0,R0                | ;UNIT #0 ENTRY, RUN DIAG       |
| 000012 | 012701 | 177500 | TA11M:     | MOV #177500,R1           | ;LOAD CSR ADDR IN R1           |
| 000016 | 010704 |        |            | MOV PC,R4                | ;RETURN ADDR.                  |
| 000020 | 103042 |        |            | BCC BDIAG                | ;GOT DIAG. IF ENABLED.         |
| 000022 | 000402 |        |            | BR 1\$                   |                                |
| 000024 | 173000 |        |            | .WORD MRESERVED          |                                |
| 000026 | 000340 |        |            | .WORD RESERVED           |                                |
| 000030 | 010003 |        | 1\$:       | MOV R0,R3                |                                |
| 000032 | 042703 | 177776 | TA11B:     | BIC #177776,R3           | ;STRIP JUNK, ONLY UNIT 0 OR 1. |
| 000036 | 000303 |        |            | SWAB R3                  | ;PUT IN CORRECT POS.           |
| 000040 | 010311 |        |            | MOV R3,(R1)              | ;LOAD UNIT #                   |
| 000042 | 010405 |        |            | MOV R4,R5                |                                |
| 000044 | 042705 | 000177 |            | BIC #177,R5              |                                |
| 000050 | 062705 | 000132 |            | ADD #TABLE,R5            |                                |
| 000054 | 012702 | 000375 |            | MOV #375,R2              | ;XFERR COUNT.                  |
| 000060 | 112503 |        |            | MOVB (R5)+,R3            | ;SET COMPARITOR.               |
| 000062 | 112511 |        | LOOP1:     | MOVB (R5)+,(R1)          | ;LEAD COMMAND.                 |
| 000064 | 100407 |        |            | BMI DONE                 | ;WATCH FOR LAST COMMAND.       |
| 000066 | 130311 |        | LOOP2:     | BITB R3,(R1)             | ;LOOK FOR DONE BIT             |
| 000070 | 001776 |        |            | BEQ LOOP2                |                                |
| 000072 | 105202 |        |            | INCB R2                  |                                |
| 000074 | 100772 |        |            | BMI LOOP1                |                                |
| 000076 | 116112 | 000002 |            | MOVB 2(R1),(R2)          |                                |
| 000102 | 000771 |        |            | BR LOOP2                 |                                |
| 000104 | 005711 |        | DONE:      | TST (R1)                 | ;ANY ERRORS?                   |
| 000106 | 100404 |        |            | BMI ERROR                |                                |
| 000110 | 005002 |        |            | CLR R2                   |                                |
| 000112 | 120312 |        |            | CMPB R3,(R2)             | ;CORRECT CODE IN LOC 0?        |
| 000114 | 001001 |        |            | BNE ERROR                |                                |
| 000116 | 005007 |        |            | CLR PC                   |                                |
| 000120 | 000005 |        | ERROR:     | RESET                    |                                |
| 000122 | 000164 | 000002 |            | JMP 2(R4)                |                                |
| 000126 | 000137 | 165564 | BDIAG:     | JMP @#DIAG               |                                |
| 000132 | 240    | 037    | 015 TABLE: | .BYTE 240,37,15,5,24,224 |                                |
| 005    | 024    | 224    |            |                          |                                |

.EVEN

000176022763  
000001

TA11E: .WORD 022763  
.END

SYMBOL TABLE

|        |           |        |           |        |           |        |           |
|--------|-----------|--------|-----------|--------|-----------|--------|-----------|
| BDIAG  | 000126    | BIT8   | = 000400  | BIT9   | = 001000  | CRCWD  | = 000000  |
| DIAG   | = 165564  | DONE   | 000104    | ERROR  | 000120    | HSRCR  | = 177550  |
| INITSW | = 173024  | LOOP1  | 000062    | LOOP2  | 000066    | MRESER | = 173000  |
| PC     | = %000007 | RESERV | = 000340  | RK05CR | = 177404  | RK06CR | = 177440  |
| RL01CR | = 174400  | RP03CR | = 176714  | RP04CR | = 176700  | RS03CR | = 172040  |
| RS04CR | = 172040  | RX01CR | = 177170  | RX02CR | = 177170  | R0     | = %000000 |
| R1     | = %000001 | R2     | = %000002 | R3     | = %000003 | R4     | = %000004 |
| R5     | = %000005 | R6     | = %000006 | R7     | = %000007 | SP     | = %000006 |
| TABLE  | 000132    | TA11   | 000000    | TA11B  | 000032    | TA11E  | 000176    |
| TA11M  | 000012    | TTCR   | = 177560  | TU10CR | = 172522  | TU16CR | = 172440  |
| TU56CR | = 177342  | .      | = 000200  |        |           |        |           |

## M9312 BOOTSTRAP ROM LISTING

THIS ROM WILL BOOT THE RP02/RP03 OPTION(S).

TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS, THE START ADDR IS 173Y04.  
 TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS, THE START ADDR IS 173Y06.  
 THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.  
 IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX  
 IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.  
 IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.  
 IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

THIS ROM WILL BOOT THE RP04/RP05 OPTION(S).

TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS, THE START ADDR IS 173Y46.  
 TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS, THE START ADDR IS 173Y50.  
 THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.  
 IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX  
 IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.  
 IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.  
 IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

|        |        |        |        |         |                               |                                 |
|--------|--------|--------|--------|---------|-------------------------------|---------------------------------|
|        |        |        |        | .SBTTL  | ;BOOT FOR RP02, RP03,         | RP04, RP05                      |
|        |        |        |        |         | ;CMND = "DP"                  | CMND = "DB"                     |
| 000000 | 042120 |        |        | RP03:   | .ASCII "PD"                   | ;ID OF RP02, RP03 BOOT.         |
| 000002 | 000042 |        |        |         | .WORD <RP03E-.+2>             | ;OFFSET TO NEXT DEVICE BOOT.    |
| 000004 | 000261 |        |        |         | SEC                           | ;UNIT 0, NO DIAG ENTRY POINT.   |
| 000006 | 012700 | 000000 |        |         | MOV #0,R0                     | ;UNIT 0, RUN DIAG ENTRY POINT.  |
| 000012 | 012701 | 176714 |        | RP03M:  | MOV #RP03CR,R1                | ;LOAD CSR ADDR. INTO R1.        |
| 000016 | 010704 |        |        |         | MOV PC,R4                     | ;ENTRY FROM CONDOLE EMULATOR.   |
| 000020 | 103060 |        |        |         | BCC BDIAG                     | ;EXERCISE DIAG. IF C=0.         |
| 000022 | 000402 |        |        |         | BR 1\$                        |                                 |
| 000024 | 173000 |        |        |         | .WORD MRESERVED               |                                 |
| 000026 | 000340 |        |        |         | .WORD RESERVED                |                                 |
| 000030 | 010003 |        |        | 1\$:    | MOV R0,R3                     |                                 |
| 000032 | 000303 |        |        |         | SWAB R3                       |                                 |
| 000034 | 010311 |        |        |         | MOV R3,(R1)                   | ;LOAD UNIT #.                   |
| 000036 | 012702 | 000005 |        |         | MOV #5,R2                     | ;CODE FOR READ.                 |
| 000042 | 000425 |        |        | RP03E:  | BR CM\$G0                     | ;GOTO COMMON BOOT CODE.         |
|        |        |        |        |         | ;NEW HEADER BLOCK BEGINS HERE |                                 |
| 000044 | 042102 |        |        | RP04:   | .ASCII "BD"                   | ;ID OF RP04, RP05 BOOT.         |
| 000046 | 000132 |        |        |         | .WORD <REND-.+2>              | ;OFFSET TO NEXT DEVICE BOOT.    |
| 000050 | 000261 |        |        |         | SEC                           | ;UNIT 0, NO DIAG. ENTRY POINT.  |
| 000052 | 012700 | 000000 |        |         | MOV #0,R0                     | ;UNIT 0, RUN DIAG. ENTRY POINT. |
| 000056 | 012701 | 176700 |        | RP04M:  | MOV #RP04CR,R1                | ;LOAD CSR ADDR. INTO R1.        |
| 000062 | 010704 |        |        |         | MOV PC,R4                     | ;ENTRY FROM CONSOLE EMULATOR.   |
| 000064 | 103036 |        |        |         | BCC BDIAG                     | ;EXERCISE DIAG IF C=0.          |
| 000066 | 010061 | 000010 |        |         | MOV R0,10(R1)                 | ;SET UNIT NUMBER.               |
| 000072 | 012702 | 000071 |        |         | MOV #71,R2                    | ;CODE FOR READ.                 |
| 000076 | 012711 | 000021 |        |         | MOV #21,(R1)                  | ;ISSUE READ IN PRESET CMND.     |
| 000102 | 012761 | 014000 | 000032 |         | MOV #14000,32(R1)             | ;SET FMT22 AND ECC INHIBIT BITS |
| 000110 | 016161 | 000016 | 000016 |         | MOV 16(R1),16(R1)             | ;WRITE ATTENTION SUMMARY REG.   |
|        |        |        |        |         |                               | ;INTO ITSELF.                   |
| 000116 | 012761 | 177000 | 000002 | CM\$G0: | MOV #-512.,2(R1)              | ;LOAD WORD COUNT.               |

```

000124 011103          MOV      (R1),R3          ;GET CSR CONTENTS.
000126 042703 000377   BIC      #377,R3
000132 050203          BIS      R2,R3          ;SET NEW COMMAND.
000134 010311          MOV      R3,(R1)
000136 105711          1$:      TSTB     (R1)          ;WAIT FOR READY.
000140 100376          BPL      1$
000142 005711          TST      (R1)          ;LOOK FOR ERRORS.
000144 100003          BPL      CLRGO          ;NONE - CONTINUE
000146 000005          ERROR:  RESET          ;IF ERROR, INITIALIZE SYSTEM
000150 000164 000002   JMP      2(4)
000154 042711 000377   CLRGO:  BIC      #377,(R1)      ;CLEAR DEVICE (LOW BYTE)
000160 005007          CLR      R7          ;AWAY WE GO TO THE NEWLY LOADED CODE!
000162 000137 165564   BDIAG:  JMP      @#DIAG          ;GOTO DIAGNOSTICS.
;*****
;RP02,RP03 ENTRY FOR UNIT #1, NO DIAG
;*****
000166 000261          SEC
;*****
;RP02,RP03 ENTRY FOR UNIT #1, RUN DIAG.
;*****
000170 012700 000001   MOV      #1,R0
000174 000706          BR       RP03M
000176 000176          .=176
000176 111612          REND:   .WORD    111612
000001 000001          .END

```

## SYMBOL TABLE

|        |           |        |           |        |           |        |           |
|--------|-----------|--------|-----------|--------|-----------|--------|-----------|
| BDIAG  | 000162    | BIT8   | = 000400  | BIT9   | = 001000  | CLRGO  | 000154    |
| CM\$GO | 000116    | CRCWD  | = 000000  | DIAG   | = 165564  | ERROR  | 000146    |
| HSRCR  | = 177550  | INITSW | = 173024  | MRESER | = 173000  | PC     | = %000007 |
| REND   | 000176    | RESERV | = 000340  | RK05CR | = 177404  | RK06CR | = 177440  |
| RL01CR | = 174400  | RP03   | 000000    | RP03CR | = 176714  | RP03E  | 000042    |
| RP03M  | 000012    | RP04   | 000044    | RP04CR | = 176700  | RP04M  | 000056    |
| RS03CR | = 172040  | RS04CR | = 172040  | RX01CR | = 177170  | RX02CR | = 177170  |
| R0     | = %000000 | R1     | = %000001 | R2     | = %000002 | R3     | = %000003 |
| R4     | = %000004 | R5     | = %000005 | R6     | = %000006 | R7     | = %000007 |
| SP     | = %000006 | TTCR   | = 177560  | TU10CR | = 172522  | TU16CR | = 172440  |
| TU56CR | = 177342  | .      | = 000200  |        |           |        |           |



```

1      00100  ;<11-UTILITIES>TSBOOT.P11.145, 8-NOV-78 12:53:44, EDIT BY KINZELMAN
2      00200  .TITLE TSBOOT - TS04 M9312 BOOTSTRAP CODE (ROM PART # 23-764A9)
3      00300  .REM      !      BY PAUL KINZELMAN
4      00400                ML1-3 E63
5      00500                3-2473
6      00600                27-JUN-78
7      00700
8      00800  THIS IS THE M9312 BOOTSTRAP CODE FOR THE TS04 MAG TAPE DRIVE, WRITTEN
9      00900  TO CONFORM TO SPEC # ECB1-77-001-00-U BY ED BADGER (10 OCT 77).
10     01000
11     01100  THIS BOOTSTRAP MUST BE LOCATED IN THE 1ST 32K AREA OF THE ADDRESS SPACE.
12     01200
13     01300  THE MAGTAPE MUST HAVE A SINGLE RECORD OR FILE MARK BEFORE THE DESIRED
14     01400  BOOTSTRAP RECORD, AND THE BOOTSTRAP RECORD MUST BE 512(10) BYTES LONG.
15     01500
16     01600  THE BOOTSTRAP DOES THE FOLLOWING OPERATIONS:
17     01700          OP          IF OK, DO          IF ERR, DO
18     01800  1          SET CHAR          2          2
19     01900  2          REWIND          3          1
20     02000  3          RD FWD (TP MK)    4          1
21     02100  4          READ FWD          5          5
22     02200  5          RD PREV REV RTY EXIT          1
23     02300
24     02400  ENTER BOOT IN THE STANDARD WAY (R0 = UNIT #, R1 = TSSR BUS ADR).
25     02500  SINCE THE TS04 HAS 1 UNIT PER ADDRESS, THE UNIT # IS ROTATED LEFT 2 PLACES
26     02600  AND ADDED TO THE BUS ADR IN R1:
27     02700          MS#      TSSR ADR
28     02800          (DEFAULT) 172522
29     02900          0        172522
30     03000          1        172526
31     03100          2        172532          (ETC.)
32     03200          3        172536
33     03300
34     03400  UPON EXIT FROM THE BOOT, R1 CONTAINS THE ADDRESS OF THE TSSR REG,
35     03500  R2 CONTAINS THE TSBA REG, AND R0 LO BYTE CONTAINS THE UNIT NUMBER.
36     03600  IF YOU SUBTRACT 20 FROM R4, R4 WILL POINT TO THE ASCII ID OF THE DEVICE.
37     03700  THEREBY YOU CAN FIGURE OUT FROM WHAT MTA TYPE YOU WERE BOOTED FROM.
38     03800
39     03900  FOR THOSE OF YOU WHO KNOW NOTHING ABOUT THE TS04, HERE IS A CHEAT-SHEET.
40     04000  THE TSSR REG CONTAINS THE SSR (SUBSYSTEM RDY) BIT INDICATING THAT THE
41     04100  DRIVE IS RDY FOR THE NEXT COMMAND. THE TSSR ALSO CONTAINS THE SC (SPECIAL
42     04200  CONDITION) BIT INDICATING THAT SOMETHING ABNORMAL (USUALLY ERROR) HAPPENED
43     04300  DURING THE LAST OPERATION. TO DO AN OPERATION, WE WAIT FOR THE SSR BIT
44     04400  TO COME TRUE. WE THEN WRITE THE ADDRESS OF THE COMMAND PACKET WE WISH
45     04500  TO PERFORM INTO THE TSBA. WHEN SSR COMES TRUE AGAIN, WE CHECK
46     04600  THE SC BIT TO TELL US WHETHER ANYTHING UNUSUAL HAPPENED.
47     04700
48     04800  THE ADDRESS OF THE COMMAND PACKET MUST BE ON AN EVEN 4 WORD BOUNDARY (THE
49     04900  LO ORDER 2 BITS ARE 0). BIT 17 OF THE PACKET ADR IS MOVED TO BIT 1 OF
50     05000  THE POINTER AS WRITTEN INTO THE TSBA AND BIT 16 OF THE PACKET ADR IS
51     05100  MOVED TO BIT 0 OF THE POINTER.
52     05200  AND A FREE DINNER TO THE FIRST ONE TO COME UP WITH A SHORTER BOOTSTRAP
53     05300  THAN THIS ONE THAT DOES THE EQUIVALENT OPERATIONS!
54
55     000000  .ASECT

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56      00200      .ENABL ABS
57      00300
58      172522      TS04SR= 172522      ;FIRST TS04 STATUS REG (TSBA IS PREV WD)
59      165564      DIAG= 165564
60      022000      .=22000      ;FOR NOW
61      00700
62 022000 046523      TS04: .ASCII "SM"      ;ASCII CODE (BACKWARDS)
63 022002 000176      .WORD <CRCWD-.+2>      ;OFFSET TO NEXT DEVICE
64 022004 000261      SEC      ;ENTRY POINT TO UNIT 0 NO DIAG
65 022006 012700 000000      MOV #0,R0      ;ENTRY POINT TO DIAGNOSTICS
66 022012 012701 172522      TS04M: MOV #TS04SR,R1      ;GET THE 1ST TSSR ADR IN R1
67 022016 010704      MOV PC,R4      ;ENTRY POINT, SAVE RTN PC
68 022020 103063      BCC BDIAG      ;BR TO RUN DIAGNOSTICS
69 022022 000411      BR RSTRT      ;BR OVER RESERVED WORDS
70 022024 173000      .WORD 173000      ;THE VOICE FROM ABOVE SAID THESE
71 022026 000340      .WORD 340      ;WORDS HAD TO BE HERE
72      01800      ;(XXX24 IS EXCEPTION ADDRESS)
73      01900      ;MOVE THE FOLLOWING TO 1000:
74 022030 142010      CMPRWD: 142010      ;REWIND (1 WD)
75 022032 000000      0      ;LO 16 BITS ADR
76 022034 000000      0      ;HI 2 BITS ADR
77 022036 001000      256.*2      ;SIZE OF RECORD (512(10) BYTES)
78      02400
79 022040 140004      CMPSCH: 140004      ;SET CHARACTERISTICS CMD (4 WDS)
80 022042 001012      1012      ;LO 16 BITS OF MSG BUFF POINTER (= .)
81 022044 000000      0      ;HI 2 BITS
82      02800
83      02900      ;THE FOLLOWING MUST NOT BE MOVED AWAY FROM THE END OF THE CMD LIST
84      03000      ;THE FOLLOWING IS ALSO TAKEN AS THE MSG
85      03100      ;BUFFER POINTER SIZE AND MBF SIZE:
86 022046 010003      RSTRT: MOV R0,R3      ;COPY THE UNIT #
87      03300      ;THE FOLLOWING IS TAKEN AS THE DRV CHAR-
88      03400      ;ACTERISTICS WORD:
89 022050 010702      MOV PC,R2      ;GET WHERE WE ARE
90 022052 012705 001022      MOV #1022,R5      ;END OF COMMAND LST IN CORE
91 022056 014245      1$: MOV -(R2),-(R5)      ;MOVE IN THE COMMAND LIST
92 022060 105705      TSTB R5      ;ARE WE DONE YET?
93 022062 001375      BNE 1$      ;LOOP FOR ALL WDS (EXIT WITH R5 = 1000)
94 022064 006303      ASL R3      ;ROTATE INTO PLACE
95 022066 006303      ASL R3      ;SO WE CAN ADD IT TO THE ADR
96      04200      ;NOTE: THE FOLLOWING ASSUMES THE USER TYPED A REASONABLE NUMBER FOR
97      04300      ;THE UNIT. IF NOT, WE WILL PROBABLY GET A BUSS TIMEOUT.
98 022070 060301      ADD R3,R1      ;ADD IN TO THE BUS ADR
99 022072 010102      MOV R1,R2      ;COPY THE TS STATUS REG
100 022074 005742      TST -(R2)      ;POINT R2 TO THE TSBA
101 022076 105711      2$: TSTB (R1)      ;AND CHK FOR SSR
102 022100 100376      BPL 2$      ;BR IF SSR NOT UP YET
103      04900
104      05000      ;THE FOLLOWING MAY BE REMOVED IF WE NEED THE SPACE:
105 022102 005037 000000      CLR @#0      ;CLR OUT LOC 0 IN CASE BOOT FAILED WE'LL HALT
106      05100
107 022106 012712 001010      3$: MOV #1010,(R2)      ;DO THE SET CHARACTERISTICS
108 022112 111103      MOVB (R1),R3      ;TST SSR BIT (INIT R3 BYTE TO NEG WHEN RDY)
109 022114 100376      BPL 3$      ;BR IF NOT RDY YET
110      00400      ;DON'T NEED TO CHK ERRS BECAUSE IF IT FAILED,

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111          00500          ;THE NEXT COMMAND WILL CERTAINLY FAIL ANYWAY
112          00600
113 022116 010512          00700 LP1:  MOV    R5,(R2)          ;DO THE REWIND OR RD FWD OVER TAPE MARK
114 022120 105711          00800 4$:  TSTB   (R1)            ;TST SSR BIT
115 022122 100376          00900      BPL    4$              ;BR IF NOT RDY YET
116 022124 032711 000012  01000      BIT    #12,(R1)         ;ALLOW TERM CLASS 0 AND 4, CHK FOR OTHERS
117 022130 001346          01100      BNE    RSTRT           ;BR IF ERROR, TRY AGN
118 022132 012715 140001  01200      MOV    #140001,(R5)      ;CODE FOR RD FWD AS NEXT OPERATION
119 022136 105103          01300      COMB   R3              ;INVERT OUR FLG
120 022140 100366          01400      BPL    LP1             ;BR BACK TO DO THE RD OVER TAPE MARK
121          01500
122 022142 010512          01600 LP2:  MOV    R5,(R2)          ;DO RD FWD THE BOOT RECORD (R5=1000)
123 022144 105711          01700 6$:  TSTB   (R1)            ;TST SSR BIT
124 022146 100376          01800      BPL    6$              ;BR IF NOT RDY YET
125 022150 005711          01900      TST    (R1)            ;TST SC BIT
126 022152 100401          02000      BMI    RDBAD           ;BR IF ERROR, DO RETRY
127 022154 005007          02100      CLR    PC              ;JMP TO LOC 0
128          02200
129 022156 012715 161001  02300 RDBAD: MOV    #161001,(R5)      ;CODE FOR RD PREV REV RETRY
130 022162 105103          02400      COMB   R3              ;INVERT OUR FLG
131 022164 100366          02500      BPL    LP2             ;LOOP BACK FOR RD RETRY
132 022166 000727          02600      BR     RSTRT           ;BR TO TRY WHOLE THING AGN
133          02700
134 022170 000137 165564  02800 BDIAG: JMP     @#DIAG  ;LINK TO DIAGNOSTICS
135 022174 000000          02900      HALT                    ;THIS IS A SPARE LOCATION
136          001          03000 .IF LT 176-<.&376>
137          000          03100 .ERROR .          ;BOOTSTRAP CODE OVERFLOW
138          000          03200 .ENDC
139 022176 140726          03300 CRCWD: 140726          ;CRC FOR BOOTSTRAP
140          000001          03400 .END
BDIAG 022170          CRCWD 022176          LP2 022142          TS04 022000          . = 022200
CMRWD 022030          DIAG = 165564          RDBAD 022156          TS04M 022012
CMPSCH 022040          LP1 022116          RSTRT 022046          TS04SR= 172522
. ABS. 022200          000

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1      ;M9312 BOOTSTRAP ROM LISTING
2      ;
3      ;THIS ROM WILL BOOT THE TU58 OPTION
4      ;
5      ;TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS THE START ADDR IS 173Y04
6      ;TO BOOT UNIT 0, AND RUN CPU DIAGNOSTICS THE START ADDR IS 173Y06
7      ;THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WORD
8      ;IF THE ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX
9      ;IF THE ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX
10     ;IF THE ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX
11     ;IF THE ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX
12
13     .SBTTL TU58 BOOT
14
15     ;*****
16     ;*** NOTE: THIS BOOTSTRAP DOES NOT RETRY IF THE BOOT FAILS.
17     ;*** THIS IS NECESSARY BECAUSE RETRIES CAN DAMAGE THE
18     ;*** TAPE CARTRIDGE IF A HARDWARE FAILURE HAS OCCURRED.
19     ;*****
20     165564      DIAG= 165564
21     173000      MRESERVED      =173000
22     000340      RESERVED      =340
23     0125025     CRC          =125025
24     176500      TISCSR       =176500
25     176502      TISBFR       =176502
26     176504      TOSCSR       =176504
27     176506      TOSBFR       =176506
28     000000 042104      TU58: .ASCII "DD"      ;ASCII IDENTIFIER
29     000002 000176      .WORD <TU58E-.+2>      ;OFFSET TO NEXT BOOT
30     000004 000261      SEC          ;ENTRY POINT FOR UNIT 0 NO DIAGS
31     000006 012700 000000      MOV #0,R0      ;ENTRY POINT FOR UNIT 0 WITH DIAGS
32     000012 012701 176500      TU58M: MOV #TISCSR,R1      ;PUT DEVICE ADDRESS IN R1
33     000016 010704      MOV PC,R4      ;DIAGNOSTIC BOILER PLATE
34     000020 103054      BCC BDIAG
35     000022 000402      BR TBOOT
36     000024 173000      .WORD MRESERVED
37     000026 000340      .WORD RESERVED
38     000030 012706 002000      TBOOT: MOV #2000,SP      ;SET STACK POINTER
39     000034 005004      CLR R4
40     000036 012702 176504      MOV #TOSCSR,R2
41     000042 005212      INC @R2      ;SEND BREAK ON SERIAL LINE
42     000044 005003      CLR R3
43     000046 004767 000046      JSR PC,SEND8      ;DELAY 7 CHARACTER TIMES
44     000052 005012      CLR @R2      ;REMOVE BREAK
45     000054 005737 176502      TST @#TISBFR      ;DUMP RECEIVE REGISTER
46     000060 012703      MOV (PC)+,R3      ;GET INIT, BOOT FLAGS
47     000062 004      .BYTE 4,10
48     000064 004767 000034      JSR PC,SEND2      ;SEND FLAGS
49     000070 010003      MOV R0,R3
50     000072 004767 000030      JSR PC,SEND1      ;SEND UNIT NUMBER
51     000076 005003      CLR R3      ;SET ADDRESS POINTER TO 0
52     000100 105711      RCVLOP: TSTB @R1      ;WAIT FOR CHARACTER RECEIVED

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53 000102 100376          BPL      RCVLOP
54 000104 113723 176502    MOVB     @#TISBFR,(R3)+ ;STORE CHARACTER IN MEMORY
55 000110 022703 001000    CMP      #1000,R3      ;512 BYTES RECEIVED?
56 000114 101371          BHI      RCVLOP        ;NO, LOOP
57 000116 005007          CLR      PC             ;YES, JUMP TO 0

58                          ;SUBROUTINE TO OUTPUT CHARACTERS TO THE SERIAL LINE
59
60
61 000120 004717          SEND8: JSR      PC,@PC      ;SEND 8 CHARACTERS
62 000122 004717          JSR      PC,@PC      ;SEND 4 CHARACTERS
63 000124 004717          SEND2: JSR      PC,@PC      ;SEND 2 CHARACTERS
64 000126 105712          SEND1: TSTB     @R2        ;TEST TRANSMIT READY
65 000130 100376          BPL      SEND1
66 000132 110337 176506    MOVB     R3,@#TOSBFR    ;SEND CHARACTER
67 000136 000303          SWAB     R3
68 000140 000207          RTS      PC
69
70                          ;ENTRY FOR UNIT 1
71
72 000142 000261          UNIT1: SEC
73 000144 012700 000001    UNIT1D: MOV     #1,R0      ;UNIT 1 NO DIAGS
74 000150 000720          BR       TU58M          ;UNIT 1 NO DIAGS
75
76 000152 000137 165564    BDIAG: JMP      @#DIAG    ;LINK TO DIAGNOSTIC ADDRESS
77
78                          .E=      <TU58+176>
79 000176 022540          TU58E: .WORD    CRC
80 000001 000001          .END

```

## SYMBOL TABLE

|         |          |         |         |         |         |         |         |        |         |
|---------|----------|---------|---------|---------|---------|---------|---------|--------|---------|
| BDIAG   | 000152R  | RCVLOP  | 000100R | SEND8   | 000120R | TOSBFR= | 176506  | TU58M  | 000012R |
| CRC     | = 022540 | RESERV= | 000340  | TBOOT   | 000030R | TOSCSR= | 176504  | UNIT1  | 000142R |
| DIAG    | = 165564 | SEND1   | 000126R | TISBFR= | 176502  | TU58    | 000000R | UNIT1D | 000144R |
| MRESER= | 173000   | SEND2   | 000124R | TISCSR= | 176500  | TU58E   | 000176R |        |         |
| . ABS.  | 000000   |         | 000     |         |         |         |         |        |         |
|         | 000200   |         | 001     |         |         |         |         |        |         |

```
1      .REM      %
2
3
4
5      IDENTIFICATION
6      -----
7
8      PRODUCT CODE:      XXXXXXXX-XX-XXXXX-X-X
9
10     PRODUCT NAME:      M9312 DECNET BOOT - DMC
11
12     PRODUCT DATE:      APRIL 1978
13
14     MAINTAINER:        DIAGNOSTIC ENGINEERING
15
16     THE INFORMATION IN THIS DOCUMENT IS SUBJECT TO CHANGE
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33     %

1      .REM      %
2      THIS ROM WILL BOOT THE DMC OPTION.
3      TO BOOT UNIT 0,AND NOT RUN DIAGNOSTICS,THE START ADDR IS 173Y04.
4      TO BOOT UNIT 0,AND RUN CPU DIAGNOSTICS,THE START ADDR IS 173Y06.
5      TO BOOT UNIT 1,AND NOT RUN DIAGNOSTICS,THE START ADDR IS 173Y30.
6      TO BOOT UNIT 1,AND RUN CPU DIAGNOSTICS,THE START ADDR IS 173Y32.
7      THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.
8      IF ROM #1 IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX
9      IF ROM #1 IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.
10     %
```

```
1          .TITLE  M9312 DECNET BOOT - DMC
2          ;      BASIC DEFINITIONS
3
4          000000      R0=%0
5          000001      R1=%1
6          000002      R2=%2
7          000003      R3=%3
8          000004      R4=%4
9          000005      R5=%5
10         000006      R6=%6
11         000007      R7=%7
12         000006      SP=%6
13         000007      PC=%7
14         000340      RESERVED=340
15         165564      DIAG=165564
16         173024      INITSW=173024
17         000000      CRCWD=0
18         173000      MRESERVED=173000
19         .NLIST  MC,MD
20         .LIST   ME
21
22
23
24
25
26
27
28
29
30
31
32
38 000000      .ENABL  ABS
39         020000      .=20000
```

```

1
2
3      ;CMND      XM
4 020000      115      130      DMCBGN: .ASCII 'MX'      ;IDENTIFIER 'XM' FOR DMC BOOT
5 020002      000576      .WORD <DMCE-.,+2>      ;OFFSET TO NEXT BOOT
6 020004      000261      SEC      ;ENTRY FOR UNIT 0, NO CPU DIAG RUN
7 020006      012700      000000      MOV #0,R0      ;ENTRY FOR UNIT 0, RUN CPU DIAG
8 020012      012701      160010      DMCN: MOV #160010,R1      ;PUT FLOATING BASE ADDR IN R1
9 020016      010704      MOV PC,R4      ;GET RETURN ADDR
10 020020      103015      BCC BDIAG      ;GO TO DIAG IF ENABLED (C=0)
11 020022      000416      BR SETSTK
12 020024      173000      .WORD MRESERVED
13 020026      000340      .WORD RESERVED
14 020030      000261      SEC      ;ENTRY FOR UNIT 1, NO CPU DIAG RUN
15 020032      012700      000001      MOV #1,R0      ;ENTRY FOR UNIT 1, RUN CPU DIAG
16 020036      000765      BR DMCN
17      ;*****
18      ;* FLOATING DEVICE INTERRUPT ROUTINE
19      ;*****
20 020040      005202      NODEV: INC R2      ;UPDATE R2 TO POINT TO NEXT DEV MODULO
21 020042      005303      DEC R3      ;SUB ONE FROM R3
22 020044      100002      BPL 1$      ;IF CANT FIND DEVICE, HALT
23 020046      000000      2$: HALT      ;      ***NOTE***
24 020050      000776      BR 2$      ;REVIEW FLOATING ADDRESS ASSIGNMENTS
25 020052      000002      1$: RTI      ;RETURN
26      ;*****
27      ;* GO TO DIAG
28      ;*****
29 020054      000137      165564      BDIAG: JMP @#DIAG      ;GO TO DIAG
30      ;RETURN MADE THROUGH ADDR IN R4
31      ;*****
32      ;* SET UP REQUEST SECONDARY BOOT MESSAGE AND STACK
33      ;*****
34 020060      012706      017776      SETSTK: MOV #17776,SP      ;SET REQ SECOND BOOT MSG POINTER
35 020064      012716      000001      MOV #1,(SP)      ;SET HIGH ORDER WORD OF MESSAGE
36 020070      012746      006010      MOV #6010,-(SP)      ;SET LOW ORDER WORD OF MESSAGE
37      ;      ***NOTE***
38      ;BOOT MSG= 10,14,1,0
39      ;STACK POINTER IS SET AT 17774
40      ;*****
41      ;* FIND THE DEVICE IN FLOATING SPACE
42      ;* VERIFY THAT TWO EXTENSION ROMS ARE PROPERLY INSTALLED
43      ;*****
44 020074      010702      2$: MOV PC,R2      ;SET UP R2 WITH
45 020076      062702      000422      ADD #DEVTAB-2$-2,R2      ;POINTER TO DEVTAB
46 020102      010704      3$: MOV PC,R4      ;SET UP R4 WITH
47 020104      062704      177734      ADD #NODEV-3$-2,R4      ;POINTER TO TRAP ROUTINE
48      ;      ***NOTE***
49      ;THE NEXT FOUR INSTRUCTIONS VERIFY THAT
50      ;THE EXTENSION ROMS ARE PROPERLY INSTALLED.
51      ;IF NOT, THE BOOT WILL HALT
52 020110      011246      MOV (R2),-(SP)      ;PUSH THE #7407 FROM ROM #3 ON THE STACK
53 020112      166416      000200      SUB 200(R4),(SP)      ;SUBTRACT FROM IT THE #2400 OFF ROM #2
54 020116      022726      005007      CMP #5007,(SP)+      ;COMP IT WITH #5007
55 020122      001402      BEQ 4$      ;IF NOT EQUAL, HALT

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```

56 020124 000000          5$: HALT          ;      ***NOTE***
57 020126 000776          BR              5$      ;CHECK POS OF ROMS #2 AND #3
58 020130 012703 000004  4$: MOV          #4,R3    ;SET R3 TO DMC POS IN FLOAT -2
59 020134 010423          MOV          R4,(R3)+    ;SET TRAP ROUTINE ADDR IN LOC 4
60 020136 005013          CLR          (R3)        ;CLR NEW PSW. R3 NOW CONTAINS DMC POS(6)
61 020140 005711          FLOAT: TST         (R1)   ;TEST FOR DEVICE, MAYBE TRAP TO NODEV
62 020142 111204          MOVB        (R2),R4      ;MODULO INCREMENT
63 020144 060401          ADD          R4,R1        ;UPDATE ADDRESS
64 020146 005201          INC          R1          ;BY MODULO
65 020150 040401          BIC          R4,R1        ;IN TABLE
66 020152 005703          TST          R3          ;IS THIS A DMC?
67 020154 001371          BNE          FLOAT       ;NOT YET
68                                     ;*****
69                                     ;* ADD UNIT DISPLACEMENT TO UNIT 0 CSR ADDR
70                                     ;*****
71 020156 042700 177760          BIC          #177760,R0 ;PREVENT TRYING TO BOOT UNIT # > 15
72 020162 010046          MOV          R0,-(SP)      ;SAVE UNIT # FOR SECONDARY BOOT
73 020164 006300          ASL          R0           ;UNIT # TIMES 2
74 020166 006300          ASL          R0           ;UNIT # TIMES 4
75 020170 006300          ASL          R0           ;UNIT # TIMES 8
76 020172 060001          ADD          R0,R1        ;CSR ADDR + UNIT*8
77 020174 000402          BR           DMC          ;GO TO MAINLINE CODE
78 020176 161040          .WORD        161040      ;CRC16 WORD FOR ROM #1
79 020200 177776          .WORD        -2          ;HEADER WORD FOR ROM #2
80                                     ;*****
81                                     ;* DMC MAINLINE
82                                     ;*****
83 020202 012704 000010  DMC: MOV          #8.,R4    ;SET RETRY COUNT
84 020206 000005          RESET         ;MASTER CLEAR DMC
85 020210 010702          MOV          PC,R2        ;RETURN ADDR
86 020212 000461          BR           DMCIN        ;INPUT TO DMC
87 020214 000043          .WORD        43          ;RQI + BASE REQUEST
88 020216 017370          .WORD        17370       ;BASE ADDR
89 020220 000000          .WORD        0           ;NO RESUME
90 020222 000402          BR           1$           ;
91 020224 173000          .WORD        MRESERVED
92 020226 000340          .WORD        RESERVED
93 020230 010702          1$: MOV          PC,R2    ;SET RETURN ADDRESS
94 020232 000451          BR           DMCIN        ;INPUT TO DMC
95 020234 000041          .WORD        41          ;RQI + CNTLI
96 020236 000000          .WORD        0           ;FILLER
97 020240 002400          .WORD        2400        ;MAINT MODE + HDX
98 020242 010702          DMCRCV: MOV        PC,R2  ;SET RETURN ADDR
99 020244 000444          BR           DMCIN        ;INPUT TO DMC
100 020246 000044          .WORD        44          ;RQI + BA.CC + RCV
101 020250 000000          .WORD        0           ;BUFFER ADDRESS
102 020252 007774          .WORD        4092.      ;SET SIZE TO MAX FOR CRC-16
103 020254 010705          MOV          PC,R5      ;SET NON-ZERO AS R5 FLAG (RCV PENDING)
104 020256 010702          DMCXMT: MOV        PC,R2 ;SET RETURN ADDR
105 020260 000436          BR           DMCIN        ;INPUT TO DMC
106 020262 000040          .WORD        40          ;RQI + BA/CC + XMIT
107 020264 017774          .WORD        17774      ;MESSAGE ADDR
108 020266 000004          .WORD        4           ;MESSAGE LENGTH
109 020270 012702 000017          MOV          #15.,R2 ;LARGE LOOP COUNTER

```

```

110 020274 105761 000002      1$:  TSTB    2(R1)          ;TEST RDY0 SET
111 020300 100002             BPL      2$          ;NOT YET
112 020302 010703             MOV     PC,R3        ;SET RETURN ADDR
113 020304 000456             BR       DMCOUT       ;CHECK DMC REQUEST
114 020306 005705      2$:  TST      R5          ;IS RECEIVE STILL OUTSTANDING
115 020310 001754             BEQ      DMCRCV       ;NO, REISSUE ONE
116 020312 005300             DEC      R0          ;DECREMENT SHORT LOOP
117 020314 001367             BNE      1$          ;AGAIN
118 020316 005302             DEC      R2          ;DECREMENT LONG LOOP
119 020320 001365             BNE      1$          ;AGAIN
120 020322 005304             DEC      R4          ;DECREMENT RETRY COUNT
121 020324 001354             BNE      DMCXMT       ;SEND AGAIN
122 020326 010702             MOV     PC,R2        ;RETURN ADDR
123 020330 000412             BR       DMCIN       ;FORCE PROC ERR-SET BASE AGAIN-KILLS DTR
124 020332 000043             .WORD    43          ;RQI + BASE REQUEST
125 020334 017370             .WORD    17370       ;BASE ADDRESS AGAIN
126 020336 000000             .WORD    0          ;NO RESUME
127 020340 012703 000012      HNGLOP: MOV    #10.,R3    ;LONG LOOP COUNTER-HOLD DTR DOWN
128 020344 005300      1$:  DEC      R0          ;DECREMENT SHORT LOOP
129 020346 001376             BNE      1$          ;AGAIN
130 020350 005303             DEC      R3          ;DECREMENT LONG LOOP
131 020352 001374             BNE      1$          ;AGAIN
132 020354 000712             BR       DMC          ;HUNG UP LONG ENOUGH-ANSWER AGAIN
133                          ;*****
134                          ;* DMC REQUEST INPUT ROUTINE
135                          ;*****
136 020356 005722      DMCIN:  TST      (R2)+        ;POINT TO FIRST PARAMETER WORD
137 020360 112211             MOVB     (R2)+,(R1)    ;COMMAND TO DMC
138 020362 005202             INC      R2          ;TO NEXT PARAMETER WORD
139 020364 105711      DMCTST: TSTB     (R1)        ;IS RDYI SET?
140 020366 100411             BMI      RDYIOK       ;YES-OK
141 020370 105761 000002      TSTB     2(R1)        ;IS RDY0 SET?
142                          ;          ***NOTE***
143                          ;IF HUNG IN LOOP, IS SW7 OF SW PACK #2 ON?
144 020374 000402             BR       1$
145 020376 114076             .WORD    114076       ;CRC16 WORD FOR ROM #2
146 020400 177776             .WORD    -2          ;HEADER WORD FOR ROM #3
147 020402 100370      1$:  BPL      DMCTST       ;NO, WAIT
148 020404 010703             MOV     PC,R3        ;SET RETURN ADDR
149 020406 000415             BR       DMCOUT       ;CHECK DMC REQUEST
150 020410 000765             BR       DMCTST       ;WAIT TILL DMC IS READY
151                          ;*****
152                          ;* DMC LOAD INPUT ROUTINE
153                          ;*****
154 020412 012261 000004      RDYIOK: MOV    (R2)+,4(R1)  ;TO FIRST HALF DMC PORT
155 020416 012261 000006      MOV     (R2)+,6(R1)  ;TO SECOND HALF DMC PORT
156 020422 000402             BR       2$
157 020424 173000             .WORD    MRESERVED
158 020426 000340             .WORD    RESERVED
159 020430 042711 000040      2$:  BIC      #40,(R1)    ;CLEAR RQI-GIVE TO DMC
160 020434 105711      1$:  TSTB     (R1)        ;TEST RDYI CLEAR
161 020436 100776             BMI      1$          ;NOT YET
162 020440 000112             JMP      (R2)        ;RETURN

```

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163 ;*****
164 ;* DMC OUTPUT READY ROUTINE
165 ;*****
166 020442 132761 000003 000002 DMCOUT: BITB #3,2(R1) ;BA/CC OR CRL REQUEST
167 020450 001013 BNE 1$ ;CTL REQUEST
168 020452 132761 000004 000002 BITB #4,2(R1) ;XMIT OR RCV
169 020460 001413 BEQ 2$ ;XMIT COMPLETE
170 020462 005005 CLR R5 ;RECEIVE COMPLETE SET NON PENDING FLAG
171 020464 005715 TST (R5) ;CHECK FOR CODE 0,LOAD 0 AT LOC 0
172 020466 001010 BNE 2$ ;RECEIVED MESSAGE NO GOOD
173 020470 012600 MOV (SP)+,R0 ;RETURN UNIT # TO R0
174 020472 000005 RESET ;CLEAR DMC-11
175 020474 000137 000006 JMP 0#6 ;AND JUMP TO LOADED PROGRAM
176 020500 032761 001730 000006 1$: BIT #1730,6(R1) ;FATAL ERROR?
177 020506 001314 BNE HNGLOP ;YES,START AGAIN AFTER TIME DELAY
178 020510 105061 000002 2$: CLRB 2(R1) ;CLEAR RDY0-THROW AWAY INFO
179 020514 000163 000002 JMP 2(R3) ;RETURN
180 ;*****
181 ;* FLOATING DEVICE MODULO TABLE
182 ;*****
183 020520 007 DEVTAB: .BYTE 7 ;DJ11 DEVICE MODULUS
184 020521 017 .BYTE 17 ;DH11
185 020522 007 .BYTE 7 ;DQ11
186 020523 007 .BYTE 7 ;DU11
187 020524 007 .BYTE 7 ;DUP11
188 020525 007 .BYTE 7 ;LK11-A
189 020526 007 .BYTE 7 ;DMC11
190 020527 000 .BYTE 0 ;FILLER
191 ; ***NOTE***
;THE NEXT 23 WORDS ARE ZERO FILLED
192 020576 060100 DMCE: .WORD 060100 ;CRC16 WORD FOR ROM #3
193 ;*****
194 ;* RELOCATION ROUTINE
195 ;*****
196 020600 020600 .=20600
197 020600 012702 020000 MOV #20000,R2
198 020604 012703 030000 MOV #30000,R3
199 020610 012223 2$: MOV (R2)+,(R3)+
200 020612 020227 020576 CMP R2,#20576
201 020616 001401 BEQ 1$
202 020620 000773 BR 2$
203 020622 000000 1$: HALT
204 000001 .END

```

SYMBOL TABLE

|         |        |        |        |        |        |         |        |         |          |
|---------|--------|--------|--------|--------|--------|---------|--------|---------|----------|
| BDIAG   | 020054 | DMCBGN | 020000 | DMCRCV | 020242 | INITSW= | 173024 | RESERV= | 000340   |
| CRCWD = | 000000 | DMCE   | 020576 | DMCTST | 020364 | MRESER= | 173000 | R6      | =%000006 |
| DEVTAB  | 020520 | DMCIN  | 020356 | DMCXMT | 020256 | NODEV   | 020040 | R7      | =%000007 |
| DIAG =  | 165564 | DMCM   | 020012 | FLOAT  | 020140 | RDYIOK  | 020412 | SETSTK  | 020060   |
| DMC     | 020202 | DMCOUT | 020442 | HNGLOP | 020340 |         |        |         |          |

```
1          .REM      %
2
3
4
5          IDENTIFICATION
6          -----
7
8          PRODUCT CODE:      XXXXXXXX-XX-XXXXX-X-X
9
10         PRODUCT NAME:      M9312 DECNET BOOT - DU11
11
12         PRODUCT DATE:      APRIL 1978
13
14         MAINTAINER:        DIAGNOSTIC ENGINEERING
15
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1      .REM      %
2      THIS ROM WILL BOOT THE DU OPTION.
3      TO BOOT UNIT 0,AND NOT RUN DIAGNOSTICS,THE START ADDR IS 173Y04.
4      TO BOOT UNIT 0,AND RUN CPU DIAGNOSTICS,THE START ADDR IS 173Y06.
5      TO BOOT UNIT 1,AND NOT RUN DIAGNOSTICS,THE START ADDR IS 173Y30.
6      TO BOOT UNIT 1,AND RUN CPU DIAGNOSTICS,THE START ADDR IS 173Y32.
7      THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.
8      IF ROM #1 IS IN SLOT 1 THE Y COMPONENT IS 00  ADDR. 1730XX
9      IF ROM #1 IS IN SLOT 2 THE Y COMPONENT IS 01  ADDR. 1732XX.
10     %

1      .TITLE    M9312 DECNET BOOT - DU11
2      ;          BASIC DEFINITIONS
3
4      000000      R0=%0
5      000001      R1=%1
6      000002      R2=%2
7      000003      R3=%3
8      000004      R4=%4
9      000005      R5=%5
10     000006      R6=%6
11     000007      R7=%7
12     000006      SP=%6
13     000007      PC=%7
14     000340      RESERVED=340
15     165564      DIAG=165564
16     173024      INITSW=173024
17     000000      CRCWD=0
18     173000      MRESERVED=173000
19     000226      SSYN=226
20     000220      DLE=220
21     000337      ASYN=337
22     000201      SOH=201
23     000005      ENQ=005
24     120001      POLY=120001
25     .NLIST      MC,MD
26     .LIST        ME
27
28
37
38
44 000000      .ENABL  ABS
45      020000      .=20000

```

```

1
2
3
4 020000      125      130
5 020002      000576
6 020004      000261
7 020006      012700      000000
8 020012      012701      160010
9 020016      010704
10 020020      103015
11 020022      000416
12 020024      173000
13 020026      000340
14 020030      000261
15 020032      012700      000001
16 020036      000765
17
18
19
20 020040      005202
21 020042      005303
22 020044      100002
23 020046      000000
24 020050      000776
25 020052      000002
26
27
28
29 020054      000137      165564
30
31
32
33
34 020060      012706      017776
35 020064      042700      177760
36 020070      010016
37 020072      010702
38 020074      062702      000466
39 020100      010704
40 020102      062704      177736
41
42
43
44
45 020106      011246
46 020110      166416      000202
47 020114      022726      005412
48 020120      001402
49 020122      000000
50 020124      000776
51 020126      012703      000006
52 020132      005013
53 020134      010443

;*****
;* CMND XW (DU11)
;*****
DUBGN:  .ASCII  'UX'      ;IDENTIFIER 'XU' FOR DU11 BOOT
        .WORD   <ENDB00-.+2> ;OFFSET TO NEXT BOOT
        SEC      ;ENTRY FOR DU11, NO CPU DIAG RUN
        MOV      #0,R0      ;ENTRY FOR DU11, RUN CPU DIAG
EMDU:   MOV      #160010,R1 ;PUT FLOATING BASE ADDR IN R1
        MOV      PC,R4      ;GET RETURN ADDR
        BCC      BDIAG      ;GO TO DIAG IF ENABLED (C=0)
        BR       SETSTK
        .WORD    MRESERVED
        .WORD    RESERVED
        SEC      ;ENTRY FOR UNIT 1, NO CPU DIAG RUN
        MOV      #1,R0      ;ENTRY FOR UNIT 1, RUN CPU DIAG
        BR       EMDU
;*****
;* FLOATING DEVICE INTERRUPT ROUTINE
;*****
NODEV:  INC      R2      ;UPDATE R2 TO POINT TO NEXT DEV MODULO
        DEC      R3      ;SUB ONE FROM R3
        BPL      1$      ;IF CANT FIND DEVICE, HALT
2$:     HALT
        BR       2$      ;REVIEW FLOATING ADDRESS ASSIGNMENTS
1$:     RTI      ;RETURN
;*****
;* GO TO DIAG
;*****
BDIAG:  JMP      @#DIAG      ;GO TO DIAG
        ;RETURN MADE THROUGH ADDR IN R4
;*****
;* FIND THE DEVICE IN FLOATING SPACE
;*****
SETSTK: MOV      #17776,SP      ;SET UP STACK
        BIC      #177760,R0      ;PREVENT TRYING TO BOOT UNIT # > 15
        MOV      R0,(SP)      ;SAVE UNIT NUM AT 17776
2$:     MOV      PC,R2      ;SET UP R2 WITH
        ADD      #DEVTAB-2$,R2 ;POINTER TO DEVTAB
3$:     MOV      PC,R4      ;SET UP R4 WITH
        ADD      #NODEV-3$,R4 ;POINTER TO TRAP ROUTINE
        ; *****NOTE****
        ;THE NEXT FOUR INSTRUCTIONS VERIFY THAT
        ;THE EXTENSION ROMS ARE PROPERLY INSTALLED.
        ;IF NOT, THE BOOT WILL HALT
        ;PUSH THE #7407 FROM ROM #3 ON THE STACK
        SUB      202(R4),(SP) ;SUBTRACT FROM IT THE #1775 OFF ROM #2
        CMP      #5412,(SP)+ ;COMP IT WITH #5412
        BEQ      4$      ;IF NOT EQUAL, HALT
5$:     HALT
        ; *****NOTE****
        ;CHECK POS OF ROMS #2 AND #3
4$:     MOV      #6,R3      ;TRAP PS ADDR
        CLR      (R3)      ;CLR NEW PSW
        MOV      R4,-(R3) ;SET TRAP ROUTINE ADDR IN LOC 4

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```

54 020136 005303          DEC      R3          ;R3 CONTAINS DU11 POS IN FLOAT SPACE
55 020140 005711  FLOAT:  TST      (R1)        ;TEST FOR DEVICE, MAYBE TRAP TO NODEV
56 020142 111204          MOV      (R2),R4      ;MODULO INCREMENT
57 020144 060401          ADD      R4,R1        ;UPDATE ADDRESS
58 020146 005201          INC      R1          ;BY MODULO
59 020150 040401          BIC      R4,R1        ;IN TABLE
60 020152 005703          TST      R3          ;IS THIS A THE ONE?
61 020154 001371          BNE      FLOAT        ;NOT YET
62          ;*****
63          ;* ADD UNIT DISPLACEMENT TO UNIT 0 CSR ADDR
64          ;*****
65 020156 006300          ASL      R0          ;UNIT # TIMES 2
66 020160 006300          ASL      R0          ;UNIT # TIMES 4
67 020162 006300          ASL      R0          ;UNIT # TIMES 8
68 020164 060001          ADD      R0,R1        ;CSR ADDR + UNIT*8
69          ;*****
70          ;* SETUP TO SEND MESSAGE
71          ;*****
72 020166 012706 017440  SNDREQ: MOV      #17400+<8.*4>,SP      ;SET STACK ADDR=17400+8 TIMES LOOP DEC.
73 020172 010704          SNDRQ1: MOV     PC,R4          ;SET UP R4 WITH
74 020174 000402          BR       3$
75 020176 025174          .WORD    025174          ;CRC16 WORD FOR ROM #1
76 020200 177776          .WORD    -2            ;HEADER WORD FOR ROM #2
77 020202 062704 000344  3$:  ADD      #DUREQ-SNDRQ1-2,R4      ;POINTER TO DUREQ
78 020206 112403          MOV      (R4)+,R3      ;MESSAGE LENGTH + PAD
79          ;*****
80          ;* SEND A BLOCK ON THE LINK
81          ;*****
82 020210 012711 000006          MOV      #6,(R1)          ;SET DTR AND RTS
83 020214 012761 036226 000002  MOV      #36000+SSYN,2(R1)      ;SET FOR DU-11 (INT SYNCHRONOUS-8 BIT)
84 020222 000402          BR       2$
85 020224 173000          .WORD    MRESERVED
86 020226 000340          .WORD    RESERVED
87 020230 032711 001000  2$:  BIT      #1000,(R1)          ;TEST FOR DSR
88 020234 001775          BEQ      2$          ;NOT YET
89 020236 032711 020000  1$:  BIT      #20000,(R1)          ;TEST FOR CTS
90 020242 001775          BEQ      1$          ;NOT YET
91 020244 022121          CMP      (R1)+,(R1)+      ;SET TO XMIT CSR
92 020246 052721 000030          BIS      #30,(R1)+      ;HDX AND SEND ON
93 020252 112411          SEND:  MOV      (R4)+,(R1)      ;MOVE TO DEVICE BUFFER
94 020254 105761 177776  STEST:  TSTB     -2(R1)          ;TEST FOR DONE
95 020260 100375          BPL      STEST          ;NOT YET
96 020262 005303          DEC      R3          ;DECREMENT COUNT
97 020264 001372          BNE      SEND          ;MORE TO SEND
98          ;*****
99          ;* RECEIVE A MESSAGE FROM THE LINK
100          ;*****
101 020266 042741 000020  GETMSG: BIC      #20,-(R1)          ;DROP SEND
102 020272 024141          CMP      -(R1),-(R1)      ;RESET TO RCV CSR AND CLR RCV BUFFER
103 020274 005004          CLR      R4          ;BUFFER ADDR
104 020276 012703 000010          MOV      #8.,R3          ;HEADER LENGTH
105 020302 004767 000052          JSR      PC,RCV1          ;GET THE HEADER
106 020306 001327          BNE      SNDREQ          ;NO GOOD CRC

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107 020310 122527 000220      CMPB    (R5)+,#DLE      ;IS IT A DLE MESSAGE(LOC 0)
108 020314 001324      BNE      SNDREQ      ;NO
109 020316 113703 000002      MOVB    #2,R3      ;HIGH BYTE COUNT
110 020322 042703 177700      BIC      #177700,R3      ;CLEAR FLAGS AND OTHER BYTE
111 020326 000303      SWAB     R3      ;SWAP BYTES
112 020330 152503      BISB     (R5)+,R3      ;LOW BYTE COUNT(LOC 1)
113 020332 122323      CMPB    (R3)+,(R3)+      ;ADD TWO FOR CRC
114 020334 005004      CLR      R4      ;BUFFER ADDR
115 020336 004767 000026      JSR     PC,RECV      ;GET DATA FIELD
116 020342 001311      BNE      SNDREQ      ;NO GOOD
117 020344 005715      TST      (R5)      ;CHECK FOR CODE 0, LOAD 0 AT LOC 0
118 020346 001307      BNE      SNDREQ      ;NO
119 020350 013700 017776      MOV     @#17776,R0      ;SAVE UNIT NUM FOR SECONDARY BOOT
120 020354 000137 000006      JMP     @#6      ;TRANSFER TO IT
121
122
123
124 020360 042711 000024      RECV1:  BIC      #24,(R1)      ;CLEAR RTS AND SEARCH SYNC
125 020364 012711 000422      MOV     #422,(R1)      ;SET SEARCH,STRIP,DTR
126 020370 005005      RECV:   CLR      R5      ;INITIALIZE CRC
127 020372 000403      BR       RTEST
128 020374 000000      .WORD    0      ;FILLER
129 020376 056471      .WORD    056471      ;CRC16 WORD FOR ROM #2
130 020400 177776      .WORD    -2      ;HEADER WORD FOR ROM #3
131 020402 012702 000017      RTEST:  MOV     #15.,R2      ;LONG LOOP VALUE
132 020406 005046      CLR      -(SP)      ;SHORT LOOP
133 020410 105711      2$:      TSTB     (R1)      ;TEST FOR DEVICE DONE
134 020412 100421      BMI      RDONE      ;ALL DONE
135 020414 005316      DEC      (SP)      ;DECREMENT SHORT LOOP
136 020416 001374      BNE      2$      ;AGAIN
137 020420 005302      DEC      R2      ;DECREMENT LONG LOOP
138 020422 000402      BR       3$
139 020424 173000      .WORD    MRESERVED
140 020426 000340      .WORD    RESERVED
141 020430 001367      3$:      BNE      2$      ;KEEP GOING
142 020432 105706      TSTB     SP      ;CHECK STACK AT OR BELOW 17400
143 020434 003256      BGT      SNDRQ1      ;LOOP ONCE MOR(8 TIMES TOTAL)
144 020436 005011      CLR      (R1)      ;DROP DTR-HANG UP
145 020440 012703 000012      HNGLOP: MOV     #10.,R3      ;LONG LOOP COUNTER
146 020444 005302      4$:      DEC      R2      ;DECREMENT SHORT LOOP
147 020446 001376      BNE      4$      ;AGAIN
148 020450 005303      DEC      R3      ;DECREMENT LONG LOOP
149 020452 001374      BNE      4$      ;AGAIN
150 020454 000644      BR       SNDREQ      ;HUNG UP LONG ENOUGH-ANSWER AGAIN
151 020456 005726      RDONE:  TST      (SP)+      ;CLEAN UP STACK-LOOP CTR
152 020460 042711 000400      BIC      #400,(R1)      ;NO STRIP SYNC
153 020464 116114 000002      MOVB    2(R1),(R4)      ;STORE IT
154 020470 112446      1$:      MOVB    (R4)+,-(SP)      ;BYTE TO ADD
155 020472 012702 000010      MOV     #8.,R2      ;NUMBER BITS PER BYTE
156 020476 000241      CRCLOP: CLC      ;CLEAR CARRY
157 020500 006005      ROR      R5      ;LOW BIT PARTIAL TO CARRY
158 020502 006016      ROR      (SP)      ;CARRY TO BYTE AND BYTE TO CARRY
159 020504 102006      BVC     1$      ;XOR OF PARTIAL AND BYTE(LOW BITS)

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160 020506 012746 120001      MOV      #POLY,-(SP)      ;XOR POLY TO PARTIAL(4 INSTRUCTIONS)
161 020512 040516             BIC      R5,(SP)          ;NOT PARTIAL AND POLY
162 020514 042705 120001      BIC      #POLY,R5          ;NOT POLY AND PARTIAL
163 020520 052605             BIS      (SP)+,R5          ;POLY XOR PARTIAL
164 020522 005302      1$:    DEC      R2              ;DECREMENT BIT COUNT
165 020524 003364             BGT      CRCL0P            ;ONCE MORE
166 020526 005726             TST      (SP)+            ;CLEAN UP STACK-BYTE TO ADD
167 020530 005303             DEC      R3              ;DECREMENT BYTE COUNT
168 020532 003323             BGT      RTEST            ;ONCE MORE
169 020534 005705             TST      R5              ;SET CC
170 020536 000207             RTS      PC              ;RETURN
171                          ;*****
172                          ;* DECNET BOOT REQUEST
173                          ;*****
174 020540      024      226      226      DUREQ: .BYTE      20.,SSYN,SSYN,SSYN,DLE,4,300,0,0,1,021,120
      020543      226      220      004
      020546      300      000      000
      020551      001      021      120
175
176 020554      010      002      001      .BYTE      10,2,1,0,242,60      ;DUREQ REQUEST MESSAGE
      020557      000      242      060
177
178                          ;*****
179                          ;* FLOATING DEVICE MODULO
180                          ;*****
181 020562      007      DEVTAB: .BYTE      7              ;DJ11 DEVICE MODULUS
182 020563      017      .BYTE      17              ;DH11
183 020564      007      .BYTE      7              ;DQ11
184 020565      007      .BYTE      7              ;DU11
185
186                          ;      ***NOTE***
                          ;THE NEXT 4 WORDS ARE ZERO FILLED
187 020576 075042      ENDBOO: .WORD      075042      ;CRC16 WORD FOR ROM #3
188                          ;*****
189                          ;* RELOCATION ROUTINE
190                          ;*****
191                          .=20600
192 020600 012702 020000      MOV      #20000,R2
193 020604 012703 030000      MOV      #30000,R3
194 020610 012223      2$:    MOV      (R2)+,(R3)+
195 020612 020227 020576      CMP      R2,#20576
196 020616 001401      BEQ      1$
197 020620 000773      BR      2$
198 020622 000000      1$:    HALT
199      000001      .END

```

## SYMBOL TABLE

|                |               |                |                |               |
|----------------|---------------|----------------|----------------|---------------|
| ASYN = 000337  | DUBGN 020000  | HNGLOP 020440  | RECV1 020360   | SETSTK 020060 |
| BDIAG 020054   | DUREQ 020540  | INITSW= 173024 | RESERV= 000340 | SNDREQ 020166 |
| CRCLOP 020476  | EMDU 020012   | MRESER= 173000 | RTEST 020402   | SNDRQ1 020172 |
| CRCWD = 000000 | ENDBOO 020576 | NODEV 020040   | R6 =%000006    | SOH = 000201  |
| DEVTAB 020562  | ENQ = 000005  | POLY = 120001  | R7 =%000007    | SSYN = 000226 |
| DIAG = 165564  | FLOAT 020140  | RDONE 020456   | SEND 020252    | STEST 020254  |
| DLE = 000220   | GETMSG 020266 | RECV 020370    |                |               |

```
1      .REM      %
2
3
4
5      IDENTIFICATION
6      -----
7
8      PRODUCT CODE:      XXXXXXXX-XX-XXXXX-X-X
9
10     PRODUCT NAME:      M9312 DECNET BOOT - DUP11
11
12     PRODUCT DATE:      APRIL 1978
13
14     MAINTAINER:        DIAGNOSTIC ENGINEERING
15
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17     WITHOUT NOTICE AND SHOULD NOT BE CONSTRUED AS A COMMITMENT
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33     %
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1      .REM      %
2      THIS ROM WILL BOOT THE DUP OPTION.
3      TO BOOT UNIT 0,AND NOT RUN DIAGNOSTICS,THE START ADDR IS 173Y04.
4      TO BOOT UNIT 0,AND RUN CPU DIAGNOSTICS,THE START ADDR IS 173Y06.
5      TO BOOT UNIT 1,AND NOT RUN DIAGNOSTICS,THE START ADDR IS 173Y30.
6      TO BOOT UNIT 1,AND RUN CPU DIAGNOSTICS,THE START ADDR IS 173Y32.
7      THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.
8      IF ROM #1 IS IN SLOT 1 THE Y COMPONENT IS 00  ADDR. 1730XX
9      IF ROM #1 IS IN SLOT 2 THE Y COMPONENT IS 01  ADDR. 1732XX.
10     %

1      .TITLE  M9312 DECNET BOOT - DUP11
2      ;      BASIC DEFINITIONS
3
4      000000      R0=%0
5      000001      R1=%1
6      000002      R2=%2
7      000003      R3=%3
8      000004      R4=%4
9      000005      R5=%5
10     000006      R6=%6
11     000007      R7=%7
12     000006      SP=%6
13     000007      PC=%7
14     000340      RESERVED=340
15     165564      DIAG=165564
16     173024      INITSW=173024
17     000000      CRCWD=0
18     173000      MRESERVED=173000
19     000226      SSYN=226
20     000220      DLE=220
21     000337      ASYN=337
22     000201      SOH=201
23     000005      ENQ=005
24     120001      POLY=120001
25     .NLIST  MC,MD
26     .LIST   ME
27
37
38
44 000000      .ENABL  ABS
45      020000      .=20000

```

```

1
2
3
4 020000      127      130
5 020002      000576
6 020004      000261
7 020006      012700      000000
8 020012      012701      160010
9 020016      010704
10 020020      103015
11 020022      000416
12 020024      173000
13 020026      000340
14 020030      000261
15 020032      012700      000001
16 020036      000765
17
18
19
20 020040      005202
21 020042      005303
22 020044      100002
23 020046      000000
24 020050      000776
25 020052      000002
26
27
28
29 020054      000137      165564
30
31
32
33
34 020060      012706      017776
35 020064      042700      177760
36 020070      010016
37 020072      010702
38 020074      062702      000474
39 020100      010704
40 020102      062704      177736
41
42
43
44
45 020106      011246
46 020110      166416      000202
47 020114      022726      005412
48 020120      001402
49 020122      000000
50 020124      000776
51 020126      012703      000006
52 020132      005013
53 020134      010443

;*****
;* CMND XW (DUP11)
;*****
DUPBGN: .ASCII 'WX' ;IDENTIFIER 'XW' FOR DUP11 BOOT
        .WORD <ENDB00-.+2> ;OFFSET TO NEXT BOOT
        SEC ;ENTRY FOR DUP11, NO CPU DIAG RUN
        MOV #0,R0 ;ENTRY FOR DUP11, RUN CPU DIAG
EMDUP: MOV #160010,R1 ;PUT FLOATING BASE ADDR IN R1
        MOV PC,R4 ;GET RETURN ADDR
        BCC BDIAG ;GO TO DIAG IF ENABLED (C=0)
        BR SETSTK
        .WORD MRESERVED
        .WORD RESERVED
        SEC ;ENTRY FOR UNIT 1, NO CPU DIAG RUN
        MOV #1,R0 ;ENTRY FOR UNIT 1, RUN CPU DIAG
        BR EMDUP
;*****
;* FLOATING DEVICE INTERRUPT ROUTINE
;*****
NODEV: INC R2 ;UPDATE R2 TO POINT TO NEXT DEV MODULO
        DEC R3 ;SUB ONE FROM R3
        BPL 1$ ;IF CANT FIND DEVICE, HALT
2$: HALT ; ***NOTE***
        BR 2$ ;REVIEW FLOATING ADDRESS ASSIGNMENTS
1$: RTI ;RETURN
;*****
;* GO TO DIAG
;*****
BDIAG: JMP @BDIAG ;GO TO DIAG
        ;RETURN MADE THROUGH ADDR IN R4
;*****
;* FIND THE DEVICE IN FLOATING SPACE
;*****
SETSTK: MOV #17776,SP ;SET UP STACK
        BIC #177760,R0 ;PREVENT TRYING TO BOOT UNIT # > 15
        MOV R0,(SP) ;SAVE UNIT NUM AT 17776
2$: MOV PC,R2 ;SET UP R2 WITH
        ADD #DEVTAB-2$,R2 ;POINTER TO DEVTAB
3$: MOV PC,R4 ;SET UP R4 WITH
        ADD #NODEV-3$,R4 ;POINTER TO TRAP ROUTINE
        ; ***NOTE***
        ;THE NEXT FOUR INSTRUCTIONS VERIFY THAT
        ;THE EXTENSION ROMS ARE PROPERLY INSTALLED.
        ;IF NOT, THE BOOT WILL HALT
        MOV (R2),-(SP) ;PUSH THE #7407 FROM ROM #3 ON THE STACK
        SUB 202(R4),(SP) ;SUBTRACT FROM IT THE #1775 OFF ROM #2
        CMP #5412,(SP)+ ;COMP IT WITH #5412
        BEQ 4$ ;IF NOT EQUAL, HALT
5$: HALT ; ***NOTE***
        BR 5$ ;CHECK POS OF ROMS #2 AND #3
4$: MOV #6,R3 ;TRAP PS ADDR
        CLR (R3) ;CLR NEW PSW
        MOV R4,-(R3) ;SET TRAP ROUTINE ADDR IN LOC 4

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54
55 020136 005711          FLOAT: TST      (R1)          ;R3 CONTAINS DUP11 POS IN FLOAT SPACE
56 020140 111204          MOVB     (R2),R4          ;TEST FOR DEVICE, MAYBE TRAP TO NODEV
57 020142 060401          ADD      R4,R1            ;MODULO INCREMENT
58 020144 005201          INC      R1              ;UPDATE ADDRESS
59 020146 040401          BIC      R4,R1            ;BY MODULO
60 020150 005703          TST      R3              ;IN TABLE
61 020152 001371          BNE      FLOAT            ;IS THIS A THE ONE?
62                                     ;NOT YET
63                                     ;*****
64                                     ;* ADD UNIT DISPLACEMENT TO UNIT 0 CSR ADDR
65 020154 006300          ASL      R0              ;*****
66 020156 006300          ASL      R0              ;UNIT # TIMES 2
67 020160 006300          ASL      R0              ;UNIT # TIMES 4
68 020162 060001          ADD      R0,R1            ;UNIT # TIMES 8
69                                     ;CSR ADDR + UNIT*8
70                                     ;*****
71                                     ;* SETUP TO SEND MESSAGE
72 020164 012706 017440   SNDRQ: MOV     #17400+<8.*4>,SP      ;*****
73 020170 010704          SNDRQ1: MOV    PC,R4              ;SET STACK ADDR-17400+8 TIMES LOOP DEC.
74 020172 000403          BR        3$                ;SET UP R4 WITH
75 020174 000000          .WORD     0                  ;FILLER
76 020176 024572          .WORD     024572             ;CRC16 WORD FOR ROM #1
77 020200 177776          .WORD     -2                 ;HEADER WORD FOR ROM #2
78 020202 062704 000354   3$:  ADD      #DUPREQ-SNDRQ1-2,R4    ;POINTER TO DUPREQ
79 020206 112403          MOVB     (R4)+,R3            ;MESSAGE LENGTH + PAD
80                                     ;*****
81                                     ;* SEND A BLOCK ON THE LINK
82                                     ;*****
83 020210 012711 000006   MOV      #6,(R1)            ;SET DTR AND RTS
84 020214 012761 101226 000002   MOV     #101000+SSYN,2(R1)    ;SET FOR DUP-11 (DEC MODE-CRC INH)
85 020222 000402          BR        2$
86 020224 173000          .WORD     MRESERVED
87 020226 000340          .WORD     RESERVED
88 020230 032711 001000   2$:  BIT      #1000,(R1)        ;TEST FOR DSR
89 020234 001775          BEQ      2$                ;NOT YET
90 020236 032711 020000   1$:  BIT      #20000,(R1)       ;TEST FOR CTS
91 020242 001775          BEQ      1$                ;NOT YET
92 020244 022121          CMP      (R1)+,(R1)+        ;SET TO XMIT CSR
93 020246 052721 000030   BIS      #30,(R1)+        ;HDX AND SEND ON
94 020252 012711 000626   MOV      #400+SSYN,(R1)    ;START IT UP WITH TSOM
95 020256 000401          BR        STEST            ;TEST FOR DONE
96 020260 112411          SEND:  MOVB   (R4)+,(R1)      ;MOVE TO DEVICE BUFFER
97 020262 105761 177776   STEST: TSTB   -2(R1)         ;TEST FOR DONE
98 020266 100375          BPL      STEST              ;NOT YET
99 020270 005303          DEC      R3                ;DECREMENT COUNT
100 020272 001372          BNE      SEND              ;MORE TO SEND
101                                     ;*****
102                                     ;* RECEIVE A MESSAGE FROM THE LINK
103                                     ;*****
104 020274 042741 000020   GETMSG: BIC     #20,-(R1)      ;DROP SEND
105 020300 024141          CMP      -(R1),-(R1)        ;RESET TO RCV CSR AND CLR RCV BUFFER
106 020302 005004          CLR      R4                ;BUFFER ADDR

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107 020304 012703 000010      MOV      #8.,R3          ;HEADER LENGTH
108 020310 004767 000052      JSR      PC,RCV1        ;GET THE HEADER
109 020314 001323              BNE      SNDREQ        ;NO GOOD CRC
110 020316 122527 000220      CMPB     (R5)+,#DLE      ;IS IT A DLE MESSAGE(LOC 0)
111 020322 001320              BNE      SNDREQ        ;NO
112 020324 113703 000002      MOV      @#2,R3          ;HIGH BYTE COUNT
113 020330 042703 177700      BIC      #177700,R3        ;CLEAR FLAGS AND OTHER BYTE
114 020334 000303              SWAB     R3              ;SWAP BYTES
115 020336 152503              BISB     (R5)+,R3        ;LOW BYTE COUNT(LOC 1)
116 020340 122323              CMPB     (R3)+,(R3)+      ;ADD TWO FOR CRC
117 020342 005004              CLR      R4              ;BUFFER ADDR
118 020344 004767 000036      JSR      PC,RCV1        ;GET DATA FIELD
119 020350 001305              BNE      SNDREQ        ;NO GOOD
120 020352 005715              TST      (R5)            ;CHECK FOR CODE 0, LOAD 0 AT LOC 0
121 020354 001303              BNE      SNDREQ        ;NO
122 020356 013700 017776      MOV      @#17776,R0       ;SAVE UNIT NUM FOR SECONDARY BOOT
123 020362 000137 000006      JMP      @#6            ;TRANSFER TO IT
124
125      ;*****
126      ;* RECEIVE A BLOCK FROM THE LINK
127      ;*****
127 020366 042711 000024      RCV1:  BIC      #24,(R1)        ;CLEAR RTS AND SEARCH SYNC
128 020372 000403              BR       1$
129 020374 000000              .WORD    0                ;FILLER
130 020376 024437              .WORD    024437           ;CRC16 WORD FOR ROM #2
131 020400 177776              .WORD    -2              ;HEADER WORD FOR ROM #3
132 020402 012711 000422      1$:  MOV      #422,(R1)      ;SET SEARCH,STRIP,DTR
133 020406 005005              RCV:   CLR      R5          ;INITIALIZE CRC
134 020410 012702 000017      RTEST:  MOV      #15.,R2       ;LONG LOOP VALUE
135 020414 005046              CLR      -(SP)           ;SHORT LOOP
136 020416 105711              2$:   TSTB     (R1)        ;TEST FOR DEVICE DONE
137 020420 100421              BMI      RDONE          ;ALL DONE
138 020422 000402              BR       1$
139 020424 173000              .WORD    MRESERVED
140 020426 000340              .WORD    RESERVED
141 020430 005316              1$:   DEC      (SP)        ;DECREMENT SHORT LOOP
142 020432 001371              BNE      2$            ;AGAIN
143 020434 005302              DEC      R2            ;DECREMENT LONG LOOP
144 020436 001367              BNE      2$            ;KEEP GOING
145 020440 105706              TSTB     SP            ;CHECK STACK AT OR BELOW 17400
146 020442 003252              BGT      SNDRQ1         ;LOOP ONCE MOR(8 TIMES TOTAL)
147 020444 005011              CLR      (R1)        ;DROP DTR-HANG UP
148 020446 012703 000012      HNGLOP:  MOV      #10.,R3       ;LONG LOOP COUNTER
149 020452 005302              4$:   DEC      R2            ;DECREMENT SHORT LOOP
150 020454 001376              BNE      4$            ;AGAIN
151 020456 005303              DEC      R3            ;DECREMENT LONG LOOP
152 020460 001374              BNE      4$            ;AGAIN
153 020462 000640              BR       SNDREQ        ;HUNG UP LONG ENOUGH-ANSWER AGAIN
154 020464 005726              RDONE:  TST      (SP)+        ;CLEAN UP STACK-LOOP CTR
155 020466 042711 000400              BIC      #400,(R1)      ;NO STRIP SYNC
156 020472 116114 000002              MOV      2(R1),(R4)      ;STORE IT
157 020476 112446              1$:   MOV      (R4)+,-(SP)      ;BYTE TO ADD
158 020500 012702 000010              MOV      #8.,R2          ;NUMBER BITS PER BYTE
159 020504 000241              CRCLOP:  CLC          ;CLEAR CARRY

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160 020506 006005          ROR      R5          ;LOW BIT PARTIAL TO CARRY
161 020510 006016          ROR      (SP)         ;CARRY TO BYTE AND BYTE TO CARRY
162 020512 102006          BVC      1$          ;XOR OF PARTIAL AND BYTE(LOW BITS)
163 020514 012746 120001   MOV      #POLY,-(SP)   ;XOR POLY TO PARTIAL(4 INSTRUCTIONS)
164 020520 040516          BIC      R5,(SP)       ;NOT PARTIAL AND POLY
165 020522 042705 120001   BIC      #POLY,R5     ;NOT POLY AND PARTIAL
166 020526 052605          BIS      (SP)+,R5     ;POLY XOR PARTIAL
167 020530 005302          1$: DEC      R2        ;DECREMENT BIT COUNT
168 020532 003364          BGT      CRCLOP        ;ONCE MORE
169 020534 005726          TST      (SP)+        ;CLEAN UP STACK-BYTE TO ADD
170 020536 005303          DEC      R3          ;DECREMENT BYTE COUNT
171 020540 003323          BGT      RTEST        ;ONCE MORE
172 020542 005705          TST      R5          ;SET CC
173 020544 000207          RTS      PC          ;RETURN
174                                     ;*****
175                                     ;* DECNET BOOT REQUEST
176                                     ;*****
177 020546      024      226      226      DUPREQ: .BYTE  20.,SSYN,SSYN,SSYN,DLE,4,300,0,0,1,021,120
      020551      226      220      004
      020554      300      000      000
      020557      001      021      120
178
179 020562      010      012      001      .BYTE  10,10.,1,0,43,362      ;DUPREQ REQUEST MESSAGE
      020565      000      043      362
180
181                                     ;*****
182                                     ;* FLOATING DEVICE MODULO
183                                     ;*****
184 020570      007          DEVTAB: .BYTE  7          ;DJ11 DEVICE MODULUS
185 020571      017          .BYTE  17          ;DH11
186 020572      007          .BYTE  7          ;DQ11
187 020573      007          .BYTE  7          ;DU11
188 020574      007          .BYTE  7          ;DUP11
189 020575      000          .BYTE  0          ;FILLER
190
191 020576 036074          ENDB00: .WORD  036074      ;CRC16 WORD FOR ROM #3
192                                     ;*****
193                                     ;* RELOCATION ROUTINE
194                                     ;*****
195                                     .=20600
196 020600 012702 020000   MOV      #20000,R2
197 020604 012703 030000   MOV      #30000,R3
198 020610 012223          2$: MOV      (R2)+,(R3)+
199 020612 020227 020576   CMP      R2,#20576
200 020616 001401          BEQ      1$
201 020620 000773          BR       2$
202 020622 000000          1$: HALT
203      000001          .END

```



## SYMBOL TABLE

|                |               |                |                |               |
|----------------|---------------|----------------|----------------|---------------|
| ASYN = 000337  | DUPBGN 020000 | HNGLOP 020446  | RECV1 020366   | SETSTK 020060 |
| BDIAG 020054   | DUPREQ 020546 | INITSW= 173024 | RESERV= 000340 | SNDREQ 020164 |
| CRCLOP 020504  | EMDUP 020012  | MRESER= 173000 | RTEST 020410   | SNDRO1 020170 |
| CRCWD = 000000 | ENDBOO 020576 | NODEV 020040   | R6 =%000006    | SOH = 000201  |
| DEVTAB 020570  | ENQ = 000005  | POLY = 120001  | R7 =%000007    | SSYN = 000226 |
| DIAG = 165564  | FLOAT 020136  | RDONE 020464   | SEND 020260    | STEST 020262  |
| DLE = 000220   | GETMSG 020274 | RECV 020406    |                |               |

BLANK